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Impact of a stage-matched weight loss intervention on stage of change progression in predominantly African-American female primary care patients

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IMPACT OF A STAGE-MATCHED WEIGHT LOSS INTERVENTION ON STAGE OF CHANGE PROGRESSION IN PREDOMINANTLY AFRICAN-AMERICAN FEMALE PRIMARY CARE PATIENTS

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ABSTRACT

Obesity is associated with several chronic medical conditions. Certain individuals are at higher risk for obesity including low-income African American females. Despite the many benefits to weight loss, many individuals do not seek treatment. Individuals are likely to attend primary care appointments where obesity can be targeted. Although stage matched interventions based on the Transtheoretical Model (TM) have been used successfully to aid in health behavior change, few studies have examined the use of stage matched weight loss interventions in African American females. There is also a paucity of research examining the effects of stage matched weight loss interventions on TM related constructs, such as perceived stage of change (SOC), decisional balance (the perceived pros and cons of weight loss) and self-efficacy (confidence in ability to lose weight). This study examined the impact of a 6-month physician directed, stage matched weight-loss intervention on SOC, decision balance, and self-efficacy for weight loss in 158 low-income African Americans selected from primary care medical clinics.

No differences in SOC, decisional balance, and self-efficacy from baseline to end of active treatment were found for the intervention group. Similarly, no differences in SOC were found between the intervention group and the usual care control (UC) group. Attempts to detect differences in SOC were greatly attenuated by the finding that 87% of participants indicated they were already in an advanced SOC prior to the start of treatment. Self-efficacy was found to be higher in the action SOC than the maintenance SOC, which was inconsistent with past research. These results suggest that stage-matched interventions work differently in this population and may not add any additional benefit to weight loss interventions. More research is needed comparing these interventions to more general weight loss techniques in primary care samples of low-income African Americans.

INTRODUCTION AND REVIEW OF THE LITERATURE

Obesity Definition and Classification

Obesity refers specifically to having an abnormally high proportion of body fat (NHLBI, 1998). Obesity is quantified by using the body mass index (BMI), which is weight (in kilograms) divided by height (in meters) squared. Using BMI is the preferred method for classifying obesity because it (1) allows comparison of people who are of the same height, (2) is significantly correlated with total body fat content, and (3) can be calculated with minimal effort (Field, Barnoya, & Colditz, 2002; NHLBI, 1998). The National Heart, Lung, and Blood Institute (1998) has classified weight categories based on BMI. A BMI less than 18.5 kg/m^2 is underweight; 18.5-24.9 kg/m^2 is normal weight; 25-29.9 kg/m^2 is overweight; greater than 30 kg/m^2 is obese, and greater than 40 kg/m^2 is extreme obese. Waist circumference is an indirect measure of central adiposity, and correlates highly with visceral fat. Specifically, women with a waist measurement of more than 35 inches or men with a waist measurement of more than 40 inches may have a higher disease risk than people with smaller waist measurements because of where their fat is distributed (NHLBI, 1998). Using BMI and waist circumference are the most simple ways to measure obesity.

Etiology

Obesity is a complex multifactor chronic disease that develops from the interaction of genetics and environment (NHLBI, 1998). Obesity results from an imbalance between energy intake and energy expenditure. Although the relationship appears simple (increased eating and decreased activity lead to weight gain), there are more complex neurochemical pathways that underlie and influence this relationship. Leptin regulates this relationship through processes that involve sensitivity to body fat. Leptin is a molecule that is released from fat cells and acts

through leptin receptors (Zhang, Proenca, Maffei, Barone, Leopold, & Friedman 1994). The release of leptin leads to a series of neurochemical reactions, which affect food intake and body weight (Chua & Leibel, 2002). Specifically, leptin signals the brain about the quantity of stored fat. When leptin is absent due to a genetic defect, humans or animals are obese and have difficulty effectively regulating food intake and energy expenditure. If they are treated with leptin, decreases in food intake are observed, and body fat stores are normalized (Bray, 2004).

Environment is another significant factor in the etiology of obesity. It has been suggested that the obesity epidemic is mainly the result of environmental factors such as the availability of high energy/high fat foods, fast food consumption, and decreased activity as the result of television watching and computer use. The physical demands of our society have changed, and as a result, adults are engaging in less physical activity (Brantley, Myers, & Roy, 2005). For instance, less than a third of American adults report getting regular physical activity defined as light or moderate activity for 30 minutes or more 5 days per week, or 3 20-minute sessions of vigorous activity per week (Barnes & Schoenborn, 2003). Thus, it is likely that a combination of environmental and genetic factors contribute to the high rates of obesity.

Prevalence of Obesity

The occurrence of obesity has reached pandemic proportions. Both industrialized nations and developing countries are experiencing effects of the disease (Roth, Qiang, Marban, Redelt, & Lowell, 2004). Obesity rates in the United States have steadily increased over the past two decades. Most recent statistics show that 65% of Americans are overweight or obese (Hedley, Ogden, Johnson, Carroll, Curtin, & Flegal, 2004). These rates continue to be on the rise. According to NHANES data, prevalence of obesity among adults 20 years or older has risen from 22.9% during 1988-1994 to 30.4% during 1999-2002. Similar trends were found for

prevalence of overweight with rates of 55.9% during 1988-1994 to 65.1% during 1999-2002 (Flegal, Carroll, Ogden, & Johnson, 2002; Hedley et al., 2004).

Certain populations appear to show disproportionate rates of overweight and obesity. Specifically, gender, ethnicity, and socioeconomic status are risk factors associated with overweight and obesity. The NHANES data revealed how rates of overweight and obesity differed by gender, age, and racial/ethnic group. Overall, males (68.8%) were more overweight than females (61.6%). However, there were significantly more females (33.2%) than males (27.6%) meeting the criteria for obesity (BMI >30 kg/m^2). Among women who were 20 years and older, rates of obesity differed significantly between racial/ethnic groups. Specifically, African American females (49.0%) have the highest rates of obesity, followed by Mexican American (38.4%) and Caucasian females (30.7%) (Hedley et al., 2004).

In addition, socioeconomic status (SES) is related to obesity. Low-income minorities are at the highest risk for obesity in the United States (U. S. Department of Health and Human Services, 2001). Females who have a low socioeconomic status, and/or low levels of education are more likely to be obese than those from high socioeconomic status. This relationship is less consistent with males (Leigh, Fries, & Hubert, 1992). However, with the rates of obesity rising in all socioeconomic brackets of the U. S. population, the relationship between obesity and low socioeconomic status has been weakening (Zhang & Wang, 2004). Despite this decreasing trend, it is still the case that being a female, a minority, and living at a lower socioeconomic status are three risk factors for overweight/obesity. This suggests that indigent African American women are at the highest risk for obesity and are a group in need of obesity prevention/management strategies.

Health and Financial Consequences of Obesity

Decreasing the prevalence of obesity in the U.S. is important for numerous reasons. One of the most important reasons is that excessive weight is associated with an increased risk of death, usually related to cardiovascular disease (CVD) (Field, et al., 2002). There continues to be debate as to whether the relationship between obesity and increased risk of death is a linear or J-shaped distribution (Manson, Stampfer, Hennekens, & Willett, 1987; Stevens, Cai, Pamuk, Williamson, Thun, & Wood, 1998; Troiano, Frongillo, Sobal, & Levitsky, 1996; World Health Organization, 1995). Mortality rates have been found to be elevated in individuals who have both low and high BMIs. Despite this debate in regards to the shape of the relationship, research controlling for smoking status and disease states does consistently demonstrate that adults with a BMI greater than 30 kg/m^2 are at increased risk for death (Manson et al., 1987; Stevens et al., 1998).

There are several chronic diseases that are linked to obesity (Mokdad et al., 2003). Field and colleagues (2001) found that the risk of developing diabetes, gallstones, hypertension, heart disease and stroke increased with higher levels of overweight and obesity among both males and females. The risk of coronary artery disease (CAD), the narrowing of the small blood vessels that supply blood and oxygen to the heart (coronary arteries), has been found to increase with BMI and be particularly elevated for overweight and obese males (Rimm et al., 1995). Coronary heart disease continues to be the leading cause of death for both men and women in the U.S. (American Heart Association, 2005). Not only is the risk of developing CHD high among obese individuals, but they also have an increased risk of mortality from CHD. Seidell, Verschuern, van Leer, & Kromhout (1996) found obese individuals to be three times more likely than nonoverweight individuals to die from CHD. Among both males and females, body weight is

positively associated with hypertension (Ascherio et al. 1992, Field, et al., 1999; Folsom, Prinease, Kaye, & Soler, 1989). There is also an association between obesity and other medical conditions including: dyslipidemia (Denke, Sempos, & Grundy, 1994), osteoarthritis of the hip and knee (Cicuttini, Baker, & Spector, 1996; Cooper et al., 1998; Manninen, Riihimaki, Heliovaara, & Makela, 1996), and sleep apnea (Milliman, Carlisle, McGarvey, Eveloff, & Levinson, 1995; Young, Palta, Dempsey, Skatrud, Weber, & Badr, 1993). Several types of cancers are associated with obesity including: breast (among postmenopausal women) (Huang et al., 1997), endometrial (Schottenfeld & Fraumeni, 1996), gastric (Lagergren, Bergstrom, & Nyren, 1999), and colon (Ford, 1999; Giovannucci, Ascherio, Rimm, Colditz, Stampfer, & Willet, 1995; Giovannucci, Colditz, Stampfer, & Willett, 1996). Lastly, obesity is associated with reproductive problems for females including difficulty with fertility, pregnancy, and delivery (Pasquali, Pelusi, Genghini, Cacciari, & Gambineri, 2003).

Obesity not only impacts physical health, but is also associated with a decreased quality of life and other psychological symptoms. Notably, obesity is associated with depression (Carpenter, Hasin, Allison, & Faith, 2000; Dong, Sanchez, & Price, 2004; Johnston, Johnson, McLeod, & Johnston, 2004). Dong et al. (2004) found that extreme obesity is associated with increased risk for depression across gender and race groups while controlling for chronic physical disease, familial history of depression, and demographic risk factors. Obesity is associated with higher rates of reported suicidal ideation as well as suicide attempts in females but not in males. Interestingly, obesity is associated with significantly reduced rates of major depression and suicide attempts in males (Carpenter et al., 2000). It appears that the relationship between depression and obesity is significant only for females. A decreased quality of life is associated with obesity (Van Hout, Van Oudheusden, & Van Heck, 2004; White, O'Neil,

Kolotkin, & Byrne, 2004). Obese individuals are likely to experience undesired physical or social consequences as a result of their weight, which in turn can lead to a decreased quality of life (Wadden, Womble, Stunkard, & Anderson, 2002). There is also evidence of discrimination associated with being obese which can have pervasive effects on all aspects of an individual's life including: school, marriage, income, and employment (Gortmaker, Must, Perrin, Sobol, & Dietz, 1993; Roehling, 1999).

As previously stated, socioeconomic status is a significant risk factor for obesity. Therefore, the individuals at highest risk for obesity are most likely to lack health insurance and thus depend on public health services. These individuals are likely to be high utilizers of medical services especially given the number of medical conditions associated with obesity. In a study conducted by Huang and colleagues (2003), approximately 81% of low-income outpatients attending a public hospital were overweight or obese. Approximately 75% of these medical patients also had obesity-associated conditions that require an increased amount of health care.

Increased health care related to obesity leads to an increased financial burden through both direct and indirect medical costs. According to Finkelstein, Fiebelkorn, and Wang (2004), obesity related medical expenditures were 75 billion dollars in 2003. It was estimated that approximately half of these expenditures were financed by Medicare and Medicaid. There is also the indirect cost of obesity, which includes missed work, disability pensions, and loss of productivity. In year 2000 dollars, the combined direct and indirect costs of obesity were estimated at 120 billion dollars (U.S. Department of Health and Human Services, 2001). With rates of obesity and associated diseases increasing every year (Hedley et al., 2004), this financial cost is only going to increase.

Treatment of Obesity

The costs of obesity are vast and pervasive, as the consequences of the disease not only affect the individual but the society at large. In order to combat this problem, much of the obesity research has focused on treatment through weight loss. Weight loss has been associated with a decrease in risk factors for disease (NHLBI, 1998). For instance, weight loss through lifestyle modification such as diet and physical activity has been associated with reductions in blood pressure in both hypertensive and nonhypertensive patients (Cutler, 1991; Davis et al, 1993; Langford et al., 1985). There is also evidence that weight loss achieved through diet and physical activity is associated with reductions in serum triglycerides and increases in HDL-cholesterol levels (Andersen, Wadden, Bartlett, Vogt, & Weinstock, 1995; Dengel, Katzel, & Goldberg, 1995; Wing, Venditti, Jakici, Polley, & Lang, 1998). Lifestyle modifications used to treat obesity also have been found to reduce blood glucose levels in individuals with and without type 2 diabetes (Jeffery et al., 1993; Simikin-Silverman et al., 1995; Wing, Epstein, Paternostro-Bayles, Kriska, Nowalk, & Gooding, 1988; Wing, Koeske, Epstein, Nowalk, Gooding, & Becker; 1987). Thus, there is substantial evidence that weight loss can have a positive impact on obesity-related health complications.

Dietary Therapy

There are many different approaches to weight loss including: diet, physical activity, pharmocotherapy, and bariatric surgery. Several randomized control trials (RCTs) have been conducted to assess the effectiveness of these methods (NHLBI, 1998). Many of these research protocols were used to examine dietary therapies and associated weight loss. A low calorie diet (LCD) is one type of dietary therapy that can help achieve weight loss. The LCDs involve typically a reduction of caloric intake by 300-500 Kcal/day with the goal of losing 10% of initial

weight in 6 months. Very low calorie diets (VLCD) refer to a diet that involves a caloric intake of less than 800 calories a day. The VLCDs are typically high in proteins in order to decrease the loss of lean body mass (Wadden & Osei, 2002). It is essential that individuals are medically supervised when engaging in dietary therapy especially in VLCD where there is increased risk of vitamin deficiencies and other life-threatening complications. Initially, individuals on a VLCD achieve almost double the weight loss of LCDs after 16 weeks (Anderson, Vichitbandra, Qian, & Kryscio, 1999; Wadden & Bartlett, 1992). However, the long-term results demonstrate that individuals on a VLCD gain back substantially more than those on a LCD at follow-up (1 year after weight loss period) (Wadden & Osei, 2002). The NHLBI (1998) recommends the use of LCD for overweight and obese patients to lose weight. Low fat diets are also a popular dietary therapy used to obtain weight loss. Studies have shown that low fat diets typically produce weight loss through a reduction in calories (Jeffery, Hellerstedt, French, & Baxter, 1995; Sheppard, Kristal, & Kushi, 1991).

Physical Activity

Physical activity is another method used to achieve weight loss. This is either combined with a LCD or used alone. Research has shown that physical activity is inversely related to weight. Physical activity has also been found to be the most reliable predictor of long-term weight maintenance after a period of weight loss (Blair & Leermakers, 2002; DiPietro, Kohl, Barlow, & Blair, 1997; McGuire, Wing, Klem, Seagle, & Hill, 1998). In fact, higher levels of physical activity promote long-term weight loss more so than conventional methods (Jeffery, Wing, Sherwood, & Tate, 2003). Being able to incorporate physical activity into one's lifestyle appears to have a positive affect on weight maintenance over time. The NHLBI (1998) recommends that physical activity be used in conjunction with a weight loss or weight

maintenance program as it has the benefits of providing moderate weight loss in overweight and obese individuals, decreasing abdominal fat, increasing cardiovascular fitness, and assisting in the long-term maintenance of weight.

Dietary Therapy and Physical Activity

Many studies have compared combinations of diet and physical activity to ascertain which method or combination of methods provides the best initial and long-term weight loss results. Several RCTs have demonstrated support for the combination of diet and physical activity compared to the use of one strategy alone (NHLBI, 1998; Wing, 1999). After a review of the literature, the National Heart, Lung, and Blood Institute (1998) found that combined interventions are superior to diet-alone, as individuals in combined diet and physical activity groups have greater weight loss and a mean greater BMI reduction than those individuals who use diet alone. This is similar to what has been observed in other studies when comparing individuals receiving a combined intervention to physical activity alone. There is also evidence for the long-term benefits of the combined intervention. Studies have found that individuals who maintain a LCD and increased physical activity have greater weight loss than diet alone over the long term (9 months to 2 years) (NHLBI, 1998). Based on the extensive research described, the combination of diet and physical activity is more effective than either alone for both short-term and long-term weight loss.

Behavior Therapy

Using behavior therapy in conjunction with other weight loss approaches may also prove beneficial. Brownell (2000) has provided a detailed 16-week program that utilizes behavior techniques such as self-monitoring, stimulus control, problem solving, and social support to aid in weight loss. Using such behavioral techniques can provide individuals with tools that help

overcome barriers associated with compliance to dietary therapy and/or increasing physical activity. Research has supported the added benefit of behavior therapy to weight loss approaches as it has been more effective in reducing or delaying weight regain at the termination of treatment and at 1-year follow-up (Craighead, Stunkard, & O'Brien, 1981; Long, Simpson, & Allot, 1993; Wadden & Stunkard, 1986).

Pharmacotherapy

Pharmacotherapy is another mechanism that has been used in weight loss. The use of drugs to lose weight has had a tumultuous history. Most recently, there were reports that the use of fenfluramine, dexfenfluramine, and phentermine was associated with valvular heart disease-only in certain combinations (Connolly et al., 1997; Ryan et al., 1999). However, there is evidence that certain medications may help individuals lose weight safely, including some of the newest weight loss medications such as sibutramine and orlistat. Several RCTs assessing the benefits of sibutramine have found a dose-related weight loss effect. These effects have been found to be present both in the short term during initial weight loss and in the long-term during weight maintenance (Bray, Ryan, Gordon, Heidingsfelder, Cerise, & Wilson, 1996; Bray et al.,1999; Hanotin, Thomas, Jones, Leutenegger, & Drouin, 1998; James et al., 2000).

Orlistat is another obesity management medication that shows promise. Orlistat has been found to be more effective than placebo in promoting weight loss, however the effectiveness of orlistat relative to other weight loss drugs remains unclear (O'Meara, Riemsma, Shirran, Mather, & Riet, 2004). The NHLBI (1998) recommends the use of weight loss drugs only as part of a comprehensive weight loss program which includes diet and physical activity for individuals who are obese and do not have obesity related risk factors or disease.

Surgery

Bariatric surgery has now become a recognized and more readily used method for individuals with extreme obesity or who have failed at other weight loss approaches (Latifi, Kellum, DeMaria, & Sugerman, 2002). The three most common type of surgeries performed in the United States are vertical banded gastroplasty (VBG), adjusted gastric banding, and Roux-en-Y gastric bypass (RYGBP). These surgeries have gained increased popularity over the last decade, as they have become a relatively safe and effective method to lose weight (NHLBI, 1998). Gastric procedures have demonstrated favorable results with an average loss of two thirds of excess weight within 1-2 years following surgery (Latifi, et al., 2002). In addition, many obesity-associated diseases such as type 2 diabetes (Pories et al., 1995), hypertension (Kellum, DeMaria, & Sugerman, 1998; Sugerman, Felton, Sismasis, Kullum, DeMaria, & Sugerman, 1999), and dyslipidemia (Brolin, Kenler, Gorman, & Cody, 1990) either improve or are corrected after bariatric surgery and associated weight loss. However, given the invasive and risky nature of the procedure, related complications, weight regain, and revisional surgeries, this type of weight loss method is used only for extreme obesity and individuals who experience continued failure at other methods (Latifi et al., 2002).

Overall, several different methods have been shown to be effective in the treatment of obesity. There is evidence for the efficacy of diet therapy and physical activity alone, however research demonstrates that in combination they are more effective. In addition, behavior therapy has been shown to augment the benefits of diet and physical activity through many different tools used to decrease barriers. Drugs and bariatric surgeries also show promise in decreasing obesity, they are usually recommended after failed attempts at weight loss through diet therapy or physical activity, and are only medically indicated for those individuals in extreme BMI

ranges. Despite the efficacious tools available to individuals, obesity rates continue to rise. One reason for the continued problem with obesity could be that individuals are not being identified as being obese and not receiving the recommendations necessary to help treat this disease. Although individuals may realize that they are overweight, they might not be aware of the extent of the problem (i.e., overweight versus obesity) or the increased health risks/effects associated with higher weights. Not only may they have difficulty identifying this as a problem, individuals may have limited knowledge on how to lose weight (i.e., diet and physical activity) and be hesitant to do so without medical supervision.

Obesity Treatment in the Primary Care Setting

One of the settings that presents a unique opportunity to implement obesity interventions is the primary care setting. The rates of obesity tend to be higher for patients presenting to the primary care setting. Therefore, interventions implemented in this setting may reach more of the people in need (Noel, Hickner, Ettenhofer, & Gauthier, 1998). In addition, the primary care setting is ideal for intervention since patients are typically more cognizant of their health. The office visit is either related to overall health maintenance or due to an acute health concern. Given that patients are more mindful of their health when visiting their physicians, these individuals are likely to be more receptive to interventions and recommendations from their physicians. This setting offers an opportunity for physicians to identify obesity as a problem as weights are taken and BMI can easily be calculated. In fact, NHLBI (2000) and the AMA Primer for Physicians (American Medical Association, 2003) recommends that physicians document obesity, including recording the patient's BMI and waist circumference, during office visits. After this is documented, a physician has the opportunity to address lifestyle changes that can be made to help combat obesity (i.e., increasing physical activity and changing diet).

Hill and Wyatt (2002) discussed how a supportive office environment and staff can facilitate weight loss and provide encouragement for patients. The primary care office is a setting where patients can be provided with information on diet and physical activity. The patient's progress can be monitored during follow-up visits by regularly recording weight and activity levels. Since many of the patients in the primary care setting are overweight or obese (Noel et al., 1998), establishing a plan of action in a setting where health is monitored (e.g., blood pressure, glucose levels, lipids) on a long-term basis is crucial.

Many physicians do not take advantage of the opportunity to identify obesity as a problem or provide intervention in the primary care setting (Galuska, Will, Serdula, & Ford, 1999; Heath, Grant, Macheni, & Kamps, 1993). Individuals who are being advised about weight most often are females, individuals with college education, those living in the Northeast, and people actively attempting to lose weight (Galuska et al., 1999). Despite the high rates of obesity in the public hospital system and in lower socioeconomic statuses, obesity intervention in the primary care system is not being employed (Huang et al., 2003). This lack of initiative by the physicians in the primary care setting has sparked a series of recommendations and guidelines aimed at increasing weight loss interventions in the primary care setting (NHLBI, 2000). Even with this push towards incorporating intervention during the primary care visit, there continues to be little done in this setting especially with the populations who are most in need (Huang et al., 2003; Scott et al., 2004).

Lyznicki, Young, Riggs, and Davis (2001) suggest that physicians need to become more knowledgeable of obesity and related comorbidities in order to be effective in obesity intervention. In order to be effective with intervention, it is necessary for them to have a good understanding of the nature of obesity, difficulty of treating the condition, and importance of

counseling patients about realistic goals for weight reduction. Other research has suggested frequent barriers that physicians' identify as interfering with evaluation and treatment of obesity in the primary care setting include: lack of reimbursement for obesity-related treatment programs, lack of time to dedicate to weight loss and weight maintenance counseling, lack of knowledge of the chronicity of obesity, lack of data on safety and efficacy of obesity drugs, lack of patient interest or readiness for treatment, negative attitudes or stigmas about obesity, and inadequate training in the medical management of obesity (Frank, 1998; Rippe, Crossley, & Ringer, 1998; Thomas, 1995).

Obesity Treatment with Minorities

Obesity treatment is especially important in African American populations where obesity rates are high. The most recent data report that almost half of African American females in the United States are obese. Obesity is a serious problem that is associated with several major health problems in the African American population (Must, Spadano, Coakley, Field, Colditz, & Dietz, 1999). It has been suggested that because there are a higher number of African Americans in lower socioeconomic brackets, obesity is a function of economic status and not ethnicity. However, data have shown that ethnic differences in obesity are still present across education and socioeconomic levels for females (Winkleby, Kraemer, Ahn, & Varady, 1998; Zhang & Wang, 2004). This suggests that sociocultural factors may be contributing to obesity (Kumanyika, 2002). Given that the obesity rates are continuing to rise and significantly affect African Americans, especially females, it is important to understand the underlying mechanisms that contribute to the higher rates in this population.

Several different explanations have been proposed to account for the higher rates of obesity in African Americans. One explanation for the high levels of obesity rates in African

Americans is sedentary behavior. African American females have higher levels of inactivity than Caucasian females (King, Castro, Eyler, Wilcox, Sallis & Brownson, 2000). King and colleagues assessed barriers to physical activity in this group and several were endorsed including: lacking a safe place to exercise, health problems, lack of energy, bad weather, and fear of injury. They also found that caregiving duties were associated with being less active in African American females. Thus, African American females engage in high levels of sedentary behavior, which are the likely result of identified barriers.

Food habits may also be related to obesity in African Americans (Kittler & Sucher, 1998). Food deprivation in the African American culture may be particularly difficult as eating large quantities in the African American culture is not only an acceptable behavior but often encouraged. Food also plays an important role in family and social relationships. In addition, there are neighborhood factors that influence food choices as many inner city neighborhoods have a high number of fast-food establishments. Although these factors have not been specifically quantified to determine their interference in weight control, qualitative studies have identified them as barriers to dietary adherence (Airhihenbuwa, Kumanyika, Agurs, Lowe, Saunders, & Morssink, 1996; El-Kebbi et al., 1996; Vazquez, Millen, Bisset, Levelnson, & Chipkin, 1998).

Cultural differences in body image are another explanation for higher obesity in African American women. Past research has demonstrated that there are differences in standards of attractiveness between Caucasian and African American females (Flynn & Fitzgibbon, 1998; Striegel-Moore, Wilfley, Caldwell, Needham, & Brownell, 1996). African American females are less preoccupied with achieving a slender body image than Caucasians. African American women find higher weights more acceptable than Caucasians, making weight loss less of a

priority for them as it does not affect their feelings of attractiveness (Allan, Mayo, & Michel, 1993). Body image differences in African American females as well as cultural differences in diet and activity levels are likely to affect obesity and influence weight loss interventions in this population. It is important when designing an intervention for African Americans that cultural factors influencing obesity be identified and interventions be tailored to increase their effectiveness.

There are few studies of behavioral weight loss that have been conducted specifically with African American populations (Agurs-Collins, Kumanyika, Ten Have, & Adams-Campbell, 1997; Domel, Alford, Cattlett, Rodriguez, & Gench, 1992; Holm, Taussig, & Carlton, 1983; Kanders et al., 1994; Kaul & Nidiry, 1999; Kumanyika & Charleston, 1992). These interventions have resulted in modest weight loss. Although some of the weight loss methods used in these studies were designed to take into consideration cultural differences in populations, African Americans still lose less weight and lose weight more slowly than Caucasians (Kumanyika, 2002). The interventions used in these studies typically depended on an educational component. The rationale behind this approach is that the patient is uninformed about healthy eating and physical activity, thus education will lead to behavior change. This has demonstrated limited effectiveness with a majority of patients in a primary care setting and is often too simplistic (Murphree, 1994). It is important to account for differences in individuals' readiness to make changes in diet and physical activity and motivational levels when developing a weight loss program to meet someone's needs.

Transtheoretical Model

The first step in addressing weight loss effectively is to understand the motivation and predictors of weight loss. One theory that has been successfully utilized to understand behavior

change is the Transtheoretical Stages of Change model (SOC; Prochaska et al. 2002). According to this model, behavior change is categorized into five stages: precontemplation, contemplation, preparation, action, and maintenance. Movement through these stages is in a spiral pattern as relapse in behavior change is typical. Relapse through the stages occur quite frequently as people attempt behavior change. The spiral model does suggest that most relapsers will not regress all the way back to where they began or revolve endlessly in circles, since most relapsers learn from their mistakes and try new behaviors the next time around (Prochaska, DiClemente, & Norcross, 1992).

Precontemplation is the absence of intention to change behavior in the next 6 months. Individuals in this stage typically are unaware or underaware they have a problem. It is likely that friends and family are aware of the problem and this is typically the reason the individual presents for treatment. Resistance to the recognition or modification of a problem is the hallmark of this stage (Prochaska, DiClemente, & Norcross, 1992).

Contemplation occurs when individuals are aware of a problem and are considering behavior change in the next 6 months. People can remain fixed in this stage for long periods of time, as they know what they want to achieve, but are not quite ready yet to attain the target goal. In addition, they appear to struggle with the positive aspects of the problem behavior (e.g., the palatability of high fat foods) and how much effort it will take to overcome the behavior. The most salient feature of the contemplation stage is serious consideration of problem resolution (Prochaska et al., 1992).

Preparation includes individuals who intend to make a change in the next month. It is a stage that combines intention and behavioral criteria. It is likely that individuals in this stage have made some small behavioral changes, such as cutting down on a problem behavior.

Although they have made some progress in moving towards the goal of behavior change, individuals in this stage have yet to reach criteria for effective action (i.e., abstinence of substance use). Individuals in this stage are likely to score high on the contemplation and action self-report assessments measuring behaviors associated with contemplation and action, as they are intending to take action in the near future. Decision-making is what this stage was originally called (Prochaska et al., 1992).

Action is the stage in which an individual modifies his/her behavior, experiences, or environment to overcome his/her problems. This stage involves the most overt behavior change as well as considerable commitment of time and energy. Changes in behavior are most visible and receive much external recognition in this stage as people around the individual comment on the change in behavior. Someone is classified in this stage if they have been successful in altering a behavior for at least one day to as long as six months. This entails changing a behavior in order to reach some particular criterion such as abstinence. In summary, action is the stage where modification of the target behavior to an acceptable criterion and significant overt efforts to change have occurred (Prochaska et al., 1992).

Maintenance is the stage that involves prevention of relapse and consolidation of the gains attained during the action phase. This period extends from at least six months to an indeterminate period past the initial action. This stage was previously viewed as static, however it is now seen as a continuation of change rather than the absence of change. Maintenance is characterized by stabilization of behavior change and avoidance of relapse (Prochaska et al., 1992).

The transtheoretical model of behavior change has been used to promote behavior change in a variety of behaviors including: smoking (Prochaska & DiClemente, 1983), physical activity

(Marcus, Banspach, Lefebvre, Rossi, Carleton, & Abrams, 1992; Marcus et al., 1997; Marshall & Biddle, 2001), and dietary fat consumption (Greene, Rossi, Reed, Willey, & Prochaska, 1994). Past research has demonstrated that patient readiness can be improved through motivational interventions aimed at the individual's particular SOC. The readiness of an individual to quit smoking has been improved through a matched intervention to that person's motivation (Goldberg et al., 1994). In addition, the model has been successfully applied to dietary interventions aimed at reducing fat intake (Prochaska, 1992; Curry, Kristal, & Bowen, 1992) and nutrition guidance for patients with risk of cardiovascular disease (Van Der Veen et al., 2002). Lastly, the model has been successful in increasing physical activity by motivational interventions based on the SOC model (Marcus et al., 1992; Marcus et al., 1997; Marshall & Biddle, 2001).

The transtheoretical model is used to better understand motivation by assessing characteristics associated with the various SOC or readiness. Progression and regression through the various stages is common during behavior change. As relapse is likely with most efforts towards behavior change, individuals typically move to earlier stages after an initial change in health behavior (Prochaska et al., 1992). Research has demonstrated the effectiveness of interventions targeting particular motivational levels in many health behaviors including smoking, physical activity, and dietary fat consumption. Although SOC is often examined in solidarity in health behavior research, there are certain factors that may be helpful in understanding stage progression. Two factors that have been found to be helpful in understanding stage progression in health behaviors are decisional balance (pros and cons of a behavior) and self-efficacy.

Transtheoretical Model, Decisional Balance Theory, and Self-Efficacy Theory

Two theories that have been used to understand why and how people move through these stages are the decisional balance theory and the self-efficacy theory. According to the decisional balance theory (Janis & Mann, 1977), people engage in behavior based on an assessment of the pros and cons of engaging in that particular behavior. A person is likely to engage in a behavior if he/she identifies more advantages to performing that behavior than disadvantages. Progression from one stage to another (i.e., precontemplation to contemplation) has been explained by using the decisional balance theory in many health behaviors (Prochaska et al., 1994). O'Connell and Velicer (1988) reported that when assessing SOC among a population of predominantly female college students attempting to lose weight, the costs of changing the behavior outweighed the benefits for those who were in the precontemplation stage. The opposite was true for individuals in the action stage. A crossover occurred between the pros and cons of the weight control participants during the contemplation stage. Little research has focused on assessing the relationship between decisional balance (pros and cons) and SOC in low-income African American females despite the increased risk factors for obesity associated with this population (Boudreaux, Carmack, Scarinci, & Brantley, 1998; Carmack-Taylor, Boudreaux, Jefferies, Scarinci, & Brantley, 2003; O'Hea, Boudreaux, Jeffries, Carmack-Taylor, Scarinci, & Brantley, 2004).

Self-efficacy theory states that an individual's beliefs regarding his/her capabilities to perform a behavior are important in determining whether or not he/she engages in that behavior (Bandura & Adams, 1977). Research has found self-efficacy to have important predictive value in behaviors associated with weight loss including increasing physical activity and changing diet. Lower levels of self-efficacy are associated with levels of motivation similar to the

precontemplation and contemplation stages, whereas higher levels of self-efficacy are associated with the maintenance stages (DiClemente, 1986; DiClemente, Prochaska, & Gibertini, 1985; Prochaska, Velicer, Guadagnoli, Rossi, & DiClemente, 1991). The importance of self-efficacy in predicting SOC has been validated with several health behaviors including smoking cessation, physical activity, and fruit and vegetable intake (Boudreaux et al., 1998; Carmack- Taylor et al., 2003; Horacek et al., 2002; Marshall & Biddle, 2001; Prochaska et al., 1991). It has been found that higher levels of self-efficacy are associated with more advanced SOC (i.e., action and maintenance).

Transtheoretical Model and Minorities and Obesity

Understanding SOC of weight loss is important in the low-income African American population. Not only are the rates of obesity higher among this population, but also there are differences with regard to weight loss behavior in this population. African Americans tend to lose less weight and lose weight more slowly than Caucasians (Kumanyika, 2002). It is necessary to understand the underlying mechanisms in weight loss including the function of the SOC model between African American and Caucasian groups in order to tailor interventions to be the most effective. If certain variables are important for one population and not another, this needs to be addressed when utilizing the intervention.

Hawkins and colleagues (2001) examined the generalizability of the SOC model to weight loss intention among overweight and obese rural, African American women and associated predictors of change. This study was the first to examine the applicability of the SOC model to weight loss behavior in a rural African American population. The authors found that the number of benefits perceived to be associated with weight loss; the individual's friends' perceptions about his/her weight, BMI, and education were significant predictors of SOC.

Further assessment is needed in this population to assess the roles of self-efficacy and decisional balance in weight loss SOC for African American, low-income medical patients. In addition, it is important to assess SOC in this population after utilizing an intervention that is stage targeted. It is necessary to understand how this type of intervention works in different populations. Examining SOC and related factors (i.e., self-efficacy and decisional balance) in an African American female, primary care population is important as these women are at increased risk for obesity and chronic disease, and in need of intervention for weight loss (Hedley et al., 2004).

Research has suggested that self-efficacy and decisional balance may be different in the various SOC for different populations including, low-income minority populations. Boudreaux et al. (1998) found that self-efficacy and decisional balance theories were effective in differentiating smoking SOC in a low-income, predominantly African American population and were consistent with the existing literature that examined these variables with Caucasians. Research has also found a significant relationship between self-efficacy and SOC in a low-income minority medical population for three health behaviors: smoking cessation, dietary fat reduction, and exercise adoption (O'Hea et al., 2004). However, other research (Carmack-Taylor et al., 2003) suggests that decisional balance and self-efficacy are not effective predictors of SOC (exercise) in a predominantly African American low-income population. Self-efficacy and decisional balance are effective in predicting SOC for smoking in African American low-income individuals but not exercise SOC. Further research is needed to clarify and understand the role of these variables in SOC in this population. No research has examined the role of self-efficacy and decisional balance in SOC for weight loss in African American low-income primary care patients. Understanding how these variables relate to SOC for weight loss in this population is important, as this model may be different in low-income minority patients.

Stage-targeted interventions have been utilized with many health behaviors including smoking, physical activity, and diet (Greene et al., 1994; Marcus et al., 1992; Marcus et al., 1997; Marshall & Biddle, 2001; Prochaska & DiClemente, 1983). This type of treatment has been found to be effective in changing health behaviors such as smoking, physical activity, and diet by focusing the intervention on an individual's motivational stage of readiness. The research has been limited to a general population consisting of mostly middle-class Caucasians. Few studies have examined the SOC model and related theories (self-efficacy and decisional balance) in a low-income minority population (Boudreaux et al., 1998; Carmack-Taylor et al., 2003; O'Hea et al., 2004). Given that African Americans females have the highest rates of obesity (Hedley et al., 2004) and have more modest rates of weight loss (Kumanyika, 2002), it is important to assess whether a stage-targeted intervention will be effective in this population and if the mechanisms that affect weight loss will be the same (e.g., will it promote stage progression and increase motivation). It is also necessary to assess the role that self-efficacy and decisional balance have in SOC for weight loss. There has been limited application of the SOC model to this population and no studies have examined SOC for weight loss specifically.

SUMMARY AND BACKGROUND

Obesity is a highly prevalent disorder that has a vast number of health and psychological consequences for the individual (Hedley et al., 2004). For society, there are financial costs that are continuing to rise (Finklestein et al., 2004). African American females in lower socioeconomic backgrounds are more likely to be obese than other groups (Hedley et al., 2004). These individuals are also more likely to utilize public hospital systems where little is being done to address the obesity epidemic (Huang et al., 2004). Despite the numerous efficacious methods (e.g., dietary therapy, physical activity, behavior therapy, pharmacotherapy, and surgery) that can be used to facilitate weight loss, physicians are often not identifying obesity as a problem and not initiating interventions (Scott et al., 2004). There is also not strong support for obesity treatment in minorities as modest weight loss has been the outcome for the few studies that have examined African Americans. Despite the efforts of some researchers to identify cultural differences in the groups and tailor interventions to address these differences, African Americans still appear to lose less weight and lose weight more slowly than Caucasians (Kumanyika, 2002). Using culturally tailored weight loss materials along with a motivational matched method may prove most effective. Much research has demonstrated efficacy in stage-targeted interventions aimed at increasing motivation and readiness to make behavior change (Goldberg et al., 1994; Marcus et al., 1992; Marcus et al., 1997; Prochaska, 1992). Assessing how decisional balance and self-efficacy are related to SOC is also important, as research has demonstrated trends in their relationship to SOC.

Not only is it important to assess the targeted health behaviors after an intervention is implemented, but it is also necessary to understand the theoretical basis of the results. The premise behind the transtheoretical model is that by focusing the intervention on an individual's

particular motivational stage, readiness for change will increase which will lead to stage progression and subsequent behavior change. Therefore, when assessing the outcome of a weight loss intervention that is based on the transtheoretical model, not only is it important to assess the behavior change (e.g., decrease in calories, increase in physical activity), but an individual's current SOC should also be assessed. This can provide further verification that the model and underlying mechanisms were successful and responsible for causing a change.

Objective

The primary goal of this study was to determine whether a weight loss intervention implemented in a primary care setting with predominantly African American females that is tailored to the individual's readiness to change would impact weight loss SOC. Each participant was assessed at baseline (e.g., baseline SOC) and post-treatment (e.g., post-treatment SOC) to determine their SOC (e.g., precontemplation, contemplation, action, maintenance). Changes in SOC across time among the intervention group were also examined with the hypothesis that there would be a significant change (e.g., movement to a higher stage of readiness for change) after receiving the intervention. There was also a comparison of the intervention and usual care (UC) groups post-treatment SOC.

Another goal of this research was to examine the relationship between self-efficacy and decisional balance theory with weight loss SOC in African American primary care females. Higher levels of self-efficacy have been related to more advanced SOC in various health behaviors (DiClemente, 1986; DiClemente et al., 1985; Prochaska et al., 1991). The endorsement of more pros and fewer cons has been associated with more advanced SOC (e.g., action and maintenance) whereas more cons and fewer pros have been related to earlier SOC (e.g., precontemplation and contemplation) (Prochaska et al., 1994). Previous research has assessed

this model in African American patients (Boudreaux et al. 1998; Carmack-Taylor et al., 2003; O'Hea et al., 2004) and have found mixed results. However, it has not been used to examine weight loss SOC specifically, or in individuals who received a stage-targeted weight loss intervention. This research examined how self-efficacy, pros for weight loss, and cons for weight loss differed over time between the stage-targeted intervention and UC groups. In addition, the current study assessed how these variables (e.g., self-efficacy, pros for weight loss, cons for weight loss) related to SOC at baseline in this predominantly African American primary care sample. Both groups were assessed at baseline to better understand the relationship of these variables (e.g., self-efficacy, pros for weight loss, cons for weight loss) without the effect of the intervention.

Research Questions and Hypotheses

The following research questions and hypotheses were proposed:

Question #1. Will there be a difference in weight loss SOC from baseline to post-treatment among the group of individuals receiving a weight loss stage-targeted intervention?

Hypothesis: Individuals who received the stage-targeted intervention will progress to a more advanced SOC from baseline to post-treatment.

Question #2. Will participants who receive a stage-targeted intervention be at a more advanced weight loss SOC at post-treatment than individuals receiving usual care?

Hypothesis: Participants who receive a stage-targeted intervention will be at a more advanced weight loss SOC at post-treatment than individuals receiving usual care.

Question #3. Will there be a difference between the intervention and usual care groups in weight loss self-efficacy from baseline to post-treatment?

Hypothesis: Participants receiving the stage-targeted intervention will demonstrate greater increases in self-efficacy for weight loss behavior from baseline to post-treatment than those in usual care.

Question #4. Will there be a difference between the intervention and usual care groups for pros of weight loss from baseline to post-treatment?

Hypothesis: Participants receiving the stage-targeted intervention will demonstrate greater increases in "pros" (e.g., positive benefits) for weight loss behavior from baseline to post-treatment than those in the usual care group.

Question #5. Will there be a difference between the intervention and usual care groups for cons of weight loss from baseline to post-treatment?

Hypothesis: Participants receiving the stage-targeted intervention will report fewer "cons" (e.g., negative consequences) to weight loss from baseline to post-treatment than those in the usual care group.

Question #6. Will weight loss self-efficacy be related to weight loss SOC at baseline in both the intervention and usual care groups?

Hypothesis: Participants will have higher levels of self-efficacy for weight loss at more advanced stages (e.g., action and maintenance stages) than at earlier stages (e.g., precontemplation and contemplation stages) of change for weight loss.

Question #7. Will pros for weight loss be related to weight loss SOC at baseline in both the intervention and usual care groups?

Hypothesis: Participants will have more pros for weight loss at more advanced stages (e.g., action and maintenance stages) than at earlier stages (e.g., precontemplation and contemplation stages) of change for weight loss.

Question #8. Will cons for weight loss be related to weight loss SOC at baseline in both the intervention and usual care groups?

Hypothesis: Participants will have fewer cons for weight loss at more advanced stages (e.g., action and maintenance stages) than at earlier stages (e.g., precontemplation and contemplation stages) of change for weight loss.

METHOD

Participants

All participants for the current study were recruited as part of a study entitled "Primary Care Office Management of Obesity" (RO1DK57476), funded by the National Institutes of Health. Participants included overweight or obese women recruited from two primary care clinics in the Greater Baton Rouge area to participate in a weight loss study implemented in the office of their primary care physician. Eligibility criteria included women who were aged 18 to 65, overweight (BMI $\geq$ 25 kg/m^2), low income (less than $16,000 annually), clinic attendees for at least one year, and free of serious or uncontrolled medical conditions. Women with well-controlled chronic diseases (e.g., hypertension, diabetes, hyperlipidemia) were included if their medication regimens were not weight-altering. Exclusion criteria included use of weight loss or weight altering medications, pregnancy or lactation, severe psychiatric illness, alcohol intake greater than 14 drinks per week, and serious illness (e.g., renal or hepatic failure, cancer, immunological disease, uncontrolled hypertension, medically recommended dietary plan conflicting with study recommendations). The two primary care clinics included in this study serve a predominantly low-income, African American population. Therefore, it was expected that the majority of recruited patients would include African American women.

Measures

University of Rhode Island Change Assessment Scale

This is a brief global weight loss readiness assessment. The SOC algorithm consists of a brief series of self-report questions assessing weight loss intentions and current behaviors (Prochaska et al., 1992). Individuals are classified into one of four discrete stage categories. Precontemplation includes those who have no intention of losing or controlling weight in the

next six months. Contemplation includes those who are not actively trying to lose or control weight, but are seriously considering doing so in the next six months. The action stage includes those who are actively trying to lose or control weight or who have successfully done so but for less than six months. The maintenance stage includes those who have successfully maintained their weight loss for at least six months. In classifying individuals into one of the SOC, a minimum weight loss criterion is typically established as a goal such as 10% of ideal body weight or 10 lbs (Prochaska et al., 1992; see Appendix A). This scale was utilized in the current study because it is a brief measure and takes minimal time for patients to complete.

Weight Efficacy Lifestyle Questionnaire (WEL)

The WEL is a self-report scale that assesses the confidence an individual has in his/her ability to engage in weight loss behavior. There are 20 items, which describe different eating situations. The individual rates on a scale of 0 (not confident) to 9 (very confident) his/her ability to resist eating in each of the difficult situations. The WEL consists of five scales (Negative Emotions, Availability, Social Pressure, Physical Discomfort, and Positive Activities) with internal consistency of .70-.90. The WEL has demonstrated good convergent validity as it has been significantly negatively correlated (scales are scored in opposite directions) with another measure of self-efficacy, the Eating Self-Efficacy Scale ($r=-.67$, $p < .01$). (Clark, Abrams, Niaura, Eaton, & Rossi, 1991; see Appendix B).

Decisional Balance for Weight Control Questionnaire (DBQ)

The DBQ is a 20-item measure that assesses the positive aspects and the negative aspects of the decision to lose weight. This measure was designed to assess cognitive and motivational aspects of the decision to try to lose weight. Individuals are instructed to rate how important each statement is in his/her decision to lose weight on a scale of one (not important at all) to five

(extremely important). The DBQ was created to represent the eight categories suggested by Janis and Mann (1977) which included the pros and cons in each of four areas for the decision to lose weight: gains or losses for self, gains or losses for others, self-approval or disapproval, and approval or disapproval by others. The principal components analysis, item analysis, and coefficient alpha yielded a two-factor scale, labeled Pros and Cons, with 10 items on each scale. These two components accounted for 50% of the variance. There was no evidence of separate factors for the eight categories suggested by Janis and Mann. Internal consistency reliability coefficients are .91 for the pro scale and .84 for the con scale. The DBQ also demonstrated evidence that differing levels of Pros and Cons is related to differences in SOC for weight loss (O'Connell & Velicer, 1988; see Appendix C).

Other Measures

Participants completed demographic questionnaires at baseline, which included variables such as age, marital status, income, employment status, education level, and ethnicity. At each assessment period, participants were also weighed and heights were measured on calibrated scales in the primary care office. Weight and height were used to calculate body mass index (BMI) for each participant.

Procedure

Recruitment and Randomization

Study participants were recruited from sequential clinic attendees who met inclusion criteria for the study and provided written informed consent. Enrollment proceeded until each physician had a maximum of 20 patients. Eight physicians were included in this study and were randomly assigned to provide either a tailored weight loss intervention or usual care (UC). Participants were assigned to receive one of the two interventions based on the random

assignment of their physician. The physicians (not the participants) were randomized in order to avoid contamination of the information between intervention and UC groups.

Physician Training

All study physicians received two hours of instruction on the clinical practice guidelines of the National Institutes of Health – National Heart, Lung, and Blood Institute for the evaluation and management of overweight and obesity (NHLBI, 1998). All physicians were provided with training to assure minimal level of acceptable care for overweight and obese patients. The investigators of the study provided all of the training. The four intervention physicians received an additional five hours of training which included: an overview of the transtheoretical model and rationale for the study, assessment of SOC, motivational interviewing, and behavioral techniques for the modification of caloric intake and physical activity. They were provided with an overview of barriers to behavior change. Role-playing was used during the training to further develop and practice techniques.

Intervention Protocol

Tailored intervention participants received six monthly, 15-minute treatment visits with their physician. The investigators provided physicians with protocols for each visit, which included an outline of topics to be covered during that session. Handouts were provided to patients at each visit that summarized the topics discussed by their physician. These treatment materials were individually prepared and tailored to each patient by the investigators (physician, health psychologist, registered dietician, and exercise physiologist). While each of the six visits had a different focus, every session included a review of current dietary and physical activity habits and plans for future behavior change. Topics of the monthly meetings included caloric balance, decreasing dietary fat, increasing physical activity, overcoming weight loss barriers,

healthy choices when eating out and shopping, and staying motivated after treatment termination. The tailored interventions were based on information provided by participants during the initial assessment. The recommendations were also tailored to each participant by taking cultural and regional preferences into account when formulating dietary and physical activity plans, providing educational materials prepared specifically for African-Americans, and giving low-cost alternatives when making diet and physical activity recommendations.

Each of the monthly sessions included advice on incorporating lifestyle activity into daily routines (e.g., taking the stairs, parking farther away). In addition to lifestyle change recommendations, participants received recommendations to begin a walking program with the goal of reaching 150 minutes per week. Those patients who were sedentary were encouraged to start with 10 minutes per day, three days a week and increase to most days. Based on their performance, this was gradually increased to 150 minutes per week (Pate et al., 1995). For patients with physical conditions making regular walking difficult (e.g., arthritis, knee injury), other types of comparable activity such as swimming or cycling were suggested. Each month, patients' progress was assessed by physicians and new goals were established. As necessary, barriers to physical activity goals were discussed. The tailored intervention included components of both social cognitive theory and the transtheoretical model. Specific techniques drawn from these theories included goal-setting, self-monitoring, feedback, increasing social support, and discussion of decisional balance from a motivational interviewing perspective.

Usual Care Protocol

Usual care physicians were instructed to provide their usual obesity management conducted during a typical office visit. These physicians provided no structured information on diet or physical activity to patients. UC participants were seen by their physician as needed for

regular medical care. Information provided by UC participants during the initial assessment was not used during any office visits.

Reimbursement

Participants received monetary reimbursement for study participation, including $10 for monthly visits and $35 for baseline and post-treatment assessments. Reimbursement was provided to offset the expenses associated with visits, which could be problematic to study participation (e.g., transportation and childcare). Physicians received reimbursement for office visits consistent with state Medicaid policies.

Statistical Analyses

Descriptive analyses were conducted to summarize demographic and other relevant baseline variables. The differences between groups (intervention and UC) on weight loss were reported. In order to assess the first research question, McNemar Chi-Square analyses were used to examine whether there was a difference in weight loss SOC between baseline and post-treatment follow-up in the intervention group. To assess the second research question, whether there are differences in SOC at post-treatment between the intervention and UC groups, Chi-Square analyses were performed. A Repeated Measures MANOVA analysis was used to address questions three, four, and five examining the potential differences between self-efficacy, pros for weight loss, and cons for weight loss in the UC and intervention groups over time (e.g., from baseline to post-intervention follow-up). The independent variables for this analysis were group (e.g. intervention versus UC) as the between groups factor and time (e.g. baseline and post-intervention) as the within groups factor. The dependent variables in this analysis were self-efficacy, pros for weight loss and cons for weight loss. In order to assess questions six, seven, and eight, a MANOVA was performed with SOC (e.g., precontemplation, contemplation, action,

maintenance) as the independent variable and self-efficacy, pros for weight loss, and cons for weight loss as the dependent variables. The MANOVA was significant therefore LSD post hoc analyses were performed to further specify differences between the groups.

Estimated Sample Size

Power analysis for the current study was based on the Chi Square analysis used to test the primary research question examining the SOC movement from baseline to post-treatment. Using previously reported data of SOC for fat reduction, close to 40% of that study's sample increased to advanced SOC after a behavioral intervention (2-4 sessions) (Steptoe, Kerry, Rink, & Hilton, 2001). Since the current study utilized a stage-matched intervention for more sessions (6 sessions) and over a longer period of time (six months), we hypothesized more people would progress on SOC. Therefore, if at least 80% of people progressed it was determined that 158 participants would be required to achieve power levels of .80. In other words, with 158 participants there was approximately an 80% chance of detecting a small effect with alpha set at .05.

RESULTS

Participant Enrollment and Baseline Characteristics

There were 256 clinic attendees approached by study personnel in the primary care setting to participate in the study. After screenings were complete, 51 (19.9%) were ineligible to participate, as they did not meet the inclusion criteria of the study. Twenty-one of the females screened and approached for the study refused to participate (8.2% initial refusal rate). Twenty-six participants (10.1%) dropped out before completing their initial assessment. There were 158 female participants who were randomized to one of the two conditions, which resulted in 61.7% of approached women who were randomized into the study. The demographic characteristics of the study sample at baseline and 6-months are summarized in Table 1. At baseline, the majority of female participants were African American (91.9%), high school graduates (74.3%), and obese (BMI, $M = 38.72$). Approximately, 41.8% of the women were single (41.8%). In terms of the BMI categories, 12% were overweight (BMI $\geq$ 25), 48% of participants were obese (BMI $\geq$ 30), and 39.9% were extremely obese (BMI $\geq$ 40).

At 6 months, 121 participants remained in the study. There were 27 participants who dropped out, 19 from the Intervention condition and 8 from UC, 1 participant missed their 6-month appointment, and 9 participants were excluded after being diagnosed with medical conditions after enrollment which violated inclusion criteria. Given that the power analysis was based on a sample of 158, the power of the study decreased. With a sample of 121 participants, there was a 66% chance of detecting an effect with alpha set at .05 for the main outcome of progression of SOC. That is power went from .80 at 158 participants to .66 with 121 participants.

Table 1

Participant Baseline and 6-month Characteristics

	Baseline (N=158)		6-month (N=121)	
	M	SD	M	SD
Age (yrs)	41.73	12.25	43.73	11.61
Weight (kg)	100.96	19.46	100.40	19.40
BMI (kg/m^2)	38.72	7.89	38.14	6.83
	N	%	N	%
Ethnicity				
African American	144	91.1	112	92.6
Caucasian	13	8.3	8	6.6
Hispanic	1	0.6	1	0.8
Marital Status				
Married	44	27.8	33	27.3
Single	66	41.8	47	38.8
Separated, Divorced, Widowed	48	30.4	41	33.9
Graduated High School	116	74.3	84	69.4

Comparison of Study Completers versus Non-Completers

Participants who completed the post-treatment assessment (at 6 months) were compared to the participants who were lost to attrition during treatment using independent samples t-tests for continuous variables and chi-square analyses for categorical variables. No differences were found between completers and noncompleters for education, marital status, BMI, SOC, scores on

the DBQ-Pros, and WEL-Total. However, noncompleters differed from study completers in that they tended to be younger, (M = 34.44 years, SD = 11.63) versus (M = 43.10 years, SD = 11.92) (t (156) = 3.35, $p \leq 0.01$). On the DBQ-Cons, the noncompleters (M = 27.84, SD = 7.37) had significantly higher scores than the completers (M = 23.65, SD = 8.16) at baseline (t (156) = -2.39, p< .05). Thus, noncompleters reported significantly more cons for losing weight than completers at the beginning of the study.

Study Variables

Descriptive statistics on the primary variables of interest (DBQ-Pros, DBQ-Cons, and WEL-Total) were calculated (see Table 2). The measure of decisional balance yielded a score for pros of weight loss and cons of weight loss. On the weight-loss SOC measure administered at baseline, 1.9% of all the participants were in the Precontemplation stage, 16.5% in the Contemplation stage, 14.6% in the Action stage, and 67.1% of participants were in the Maintenance stage (see Figure 1). Overall, 81.7% of the participants reported being in a more advanced SOC for weight loss (i.e., Action or Maintenance). Specifically, the participants endorsed being actively engaged in weight loss or weight maintenance. Table 3 shows descriptive statistics for variables at baseline and 6-month follow-up for both the intervention and UC groups.

Table 2

Descriptive Statistics of Study Variables at Baseline for All Participants

	M	SD	Range
DB Pros	37.30	8.30	12-50
DB Cons	24.31	8.16	10-43
WEL	121.58	34.11	9-180

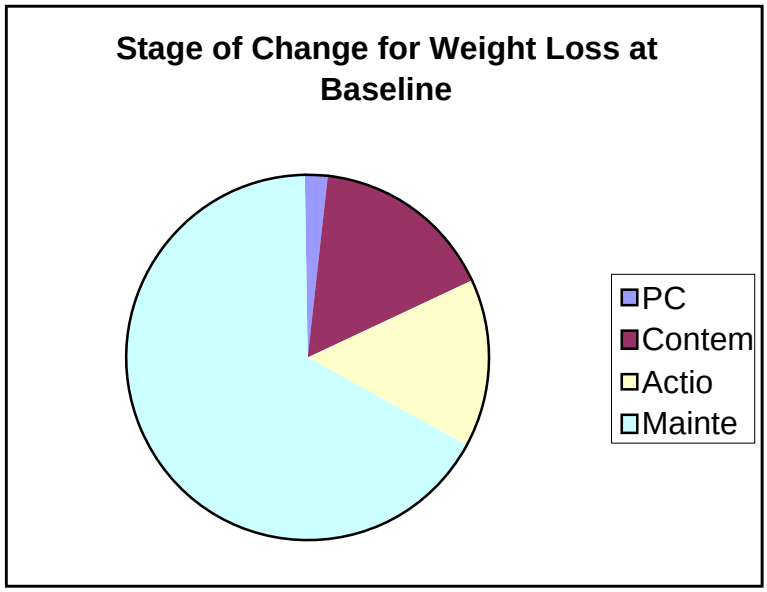

Figure 1. Percentage of Participants at each Stage of Change at Baseline

Table 3

Descriptive Statistics for Study Variables at Baseline and 6-months for Intervention versus Usual Care groups

	INTERVENTION GROUP		USUAL CARE GROUP	
	Baseline	6-months	Baseline	6-months
DB Pros	37.90 (8.85)	37.63 (8.79)	36.70 (7.71)	35.83 (7.40)
DB Cons	23.68 (8.26)	23.07 (9.50)	24.94 (8.05)	25.24 (7.47)
WEL	122.52 (31.76)	137.20 (36.99)	120.63 (36.5)	115.98 (39.64)
BMI	38.3 (8.12)	36.98 (7.31)	39.1 (7.67)	38.56 (6.41)

Comparison between Participants in the Intervention and Usual Care Groups at Baseline

Assessment of participants in the intervention and UC groups were compared on the primary outcome variables (DBQ-Pros, DBQ-Cons, and WEL-Total) and demographic variables (age, education, and BMI) at baseline using independent samples t-tests for continuous variables.

No differences were found between these groups at baseline for age, education, BMI, scores on the DBQ-Pros, DBQ-Cons, and WEL-Total (See Table 4).

Table 4

Descriptive Characteristics of Study Variables between Participants in the Intervention versus Usual Care (UC) Groups at Baseline

Variable	Group	*M*	*SD*
Age	Intervention	40.38	12.71
	UC	43.08	11.70
High School (years)	Intervention	11.60	1.09
	UC	11.25	1.51
College (years)	Intervention	1.82	1.52
	UC	1.57	1.44
BMI	Intervention	38.31	8.13
	UC	39.14	7.67
DBQ-Pros	Intervention	37.90	8.85
	UC	36.70	7.72
DBQ-Cons	Intervention	23.68	8.26
	UC	24.95	8.06
WEL-Total	Intervention	122.52	31.76
	UC	120.63	36.50

Weight Change in Intervention and Usual Care Groups

Martin and colleagues (in press) found that the intervention group demonstrated weight loss (M = -2.0 kg, SD = 3.2,) that differed significantly from zero (t_4 = -3.8, p = 0.02), whereas

the UC group did not (M = 0.2 kg, SD = 2.9). The test of treatment effect indicated that the weight change in the intervention group differed from that of the UC group ($F_{1, 4}$ = 10.2, p = 0.03), suggesting that the stage-matched intervention was effective in helping primary care female patients lose weight (see Table 5). There were more intervention participants who lost weight by the 6th month (79%) compared to UC participants (47%). There was a differential rate of drop-out in the two samples, therefore an intent to treat (ITT) analysis using baseline values carried forward for drop-outs was completed to make sure there were not significant differences in the individuals who dropped out and that these differences were not what contributed to the significant findings of weight loss. This was done to assure equal numbers in the groups therefore the values were carried forward from baseline for the individuals who dropped out. The difference in weight loss between the intervention and UC groups remained significant $F_{1, 4}$ = 3.6, p = 0.01 (Martin, Rhode, Dutton, Redman, Ryan, & Brantley, in press).

Table 5

Weight Change at 6 months between Intervention and Usual Care Groups (Martin et al., in press)

	Weight Change	*F*-value	*p*-value
Completers Analysis			
Intervention	-2.0 kg	10.2	0.03
Usual Care	+0.20 kg		
Intent to Treat Analysis			
Intervention	- 1.44 kg	3.6	0.01
Usual Care	+ 0.25 kg		

Tests of Research Questions

Question #1. Will there be a difference in weight loss SOC from baseline to post-treatment among the group of individuals receiving a weight loss stage-targeted intervention?

A McNemar Chi Square analysis was performed to assess the differences in SOC from baseline to post-treatment in the different groups. See Table 6 for percentages of participants in both groups who were in different SOC at baseline and 6 months. The Chi Square was not significant for the intervention group (X^2 (1, 4) = 5.52, p= .23) nor the UC group (X^2 (1, 9) = 4.68, p = .73). Despite the intervention group receiving an intervention based on the SOC model, these results suggest that there were no significant differences in weight loss SOC over time (baseline to post-treatment) in the different groups (intervention versus UC). Individuals in the intervention group did not progress significantly in SOC for weight loss, even after receiving a stage-matched weight loss intervention.

Table 6

Percentage of Participants in each Stage of Change for Intervention and Usual Care groups over time (N at each stage)

	INTERVENTION GROUP		USUAL CARE GROUP	
	Baseline	6-months	Baseline	6-months
Precontemplation	0% (0)	0% (0)	1.5% (1)	1.5% (1)
Contemplation	21.8% (12)	3.6% (2)	13.6% (9)	10.6% (7)
Action	16.4% (9)	21.8% (12)	18.2% (12)	13.7% (9)
Maintenance	61.8% (34)	74.6% (41)	66.7% (44)	74.2% (49)

Question #2. Will participants who receive a stage-targeted intervention be at a more advanced weight loss SOC at post-treatment than individuals receiving usual care?

A Chi Square analysis was used to examine differences in SOC at post-treatment between those individuals who received the intervention and those who did not (See Figures 2 and 3). The Chi Square analysis did not reveal differences between the intervention and UC groups for SOC (X^2 (1, 3) = 3.95, p= .27). At post-treatment, the group receiving the stage matched intervention and the UC group did not significantly differ on SOC for weight loss.

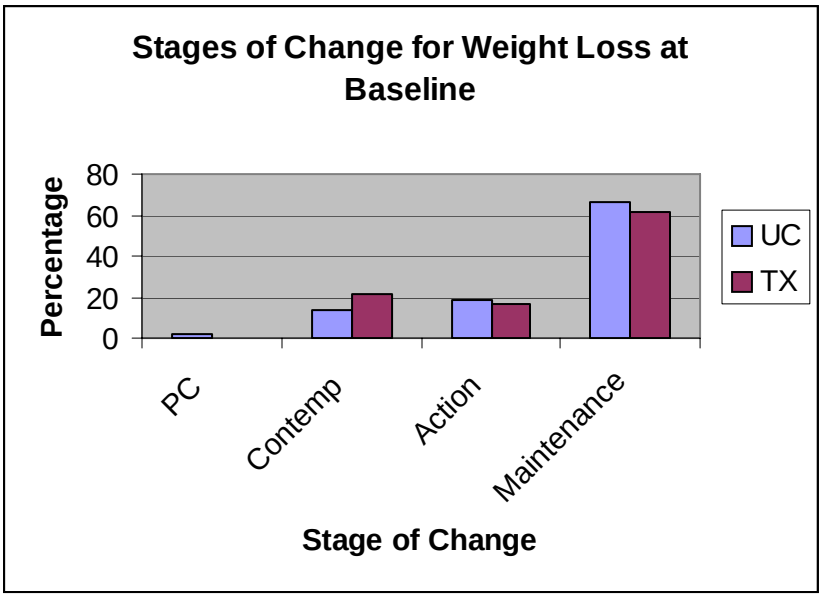

Figure 2. Percentage of Participants in the Intervention (TX) and Usual Care (UC) groups at different Stages of Change at Baseline

Question #3. Will there be a difference between the intervention and usual care groups in weight loss self-efficacy from baseline to post-treatment?

Question #4. Will there be a difference between the intervention and usual care groups for pros of weight loss from baseline to post-treatment?

Question #5. Will there be a difference between the intervention and usual care groups for cons of weight loss from baseline to post-treatment?

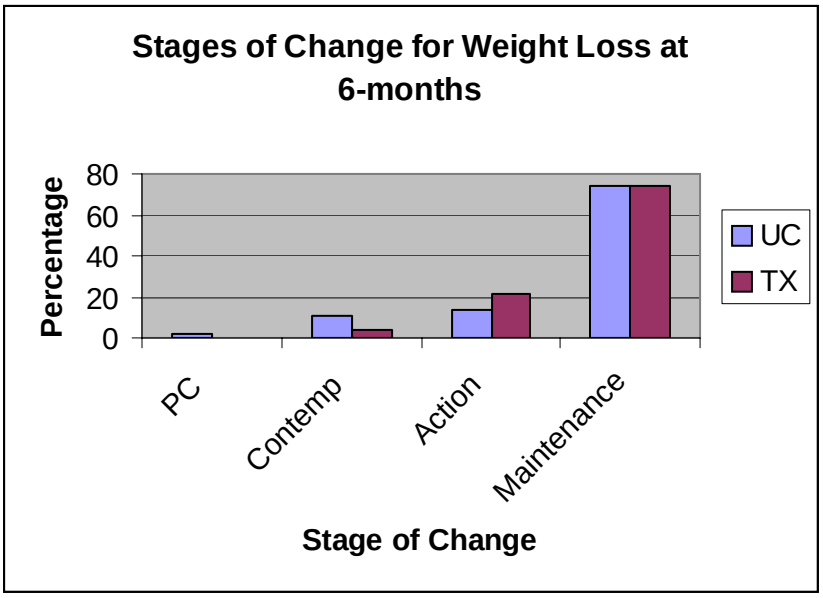

Figure 3. Percentage of Participants in the Intervention (TX) and Usual Care (UC) groups at different Stages of Change at 6-months

In order to test research questions three through five, a Repeated Measures Multivariate Analysis of Variance (MANOVA) was performed. For the analysis, the independent variables were time (baseline versus post-treatment) and group (intervention versus UC groups). The WEL as well as the DBQ with scores provided for both pros for weight loss and cons for weight loss were the dependent variables. The Repeated Measures MANOVA was significant for a group main effect, F (3, 117) = 4.09, p= .008 (See Figures 4- 6). There were no significant effects for time F (3,117) = 1.27, p=.29; or the interaction of group by time F (3, 117) = 1.65, p= .18. Follow-up one-way analysis of variance (ANOVA) revealed a significant group main effect for the WEL, F (1, 119) = 5.52, p = .020. Significant differences over the course of the treatment (baseline to 6 month follow-up) between the groups who received the intervention and for those who did not on pros for weight loss, cons for weight loss, and weight loss self-efficacy were not found. Overall, a significant difference between groups (intervention and UC) for weight loss

self-efficacy was found, however this difference can not be contributed to the effects of treatment, as the interaction variable (group by time) was not significant.

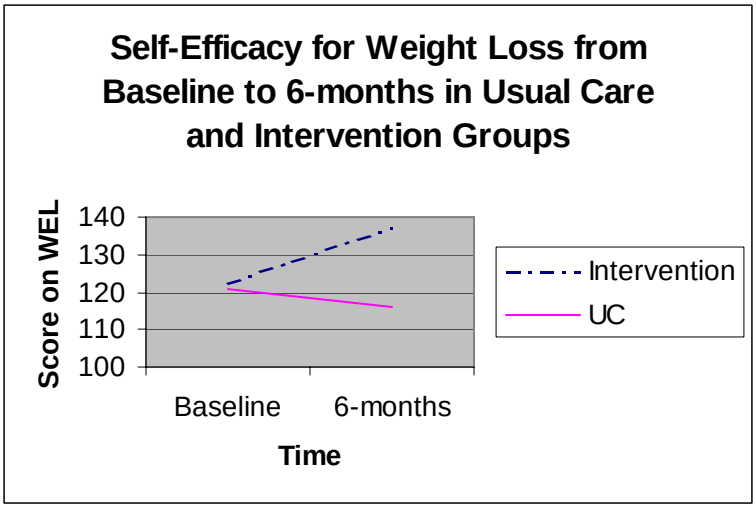

Figure 4. Differences from Baseline to 6-months for Self-Efficacy in the Usual Care and Intervention Group

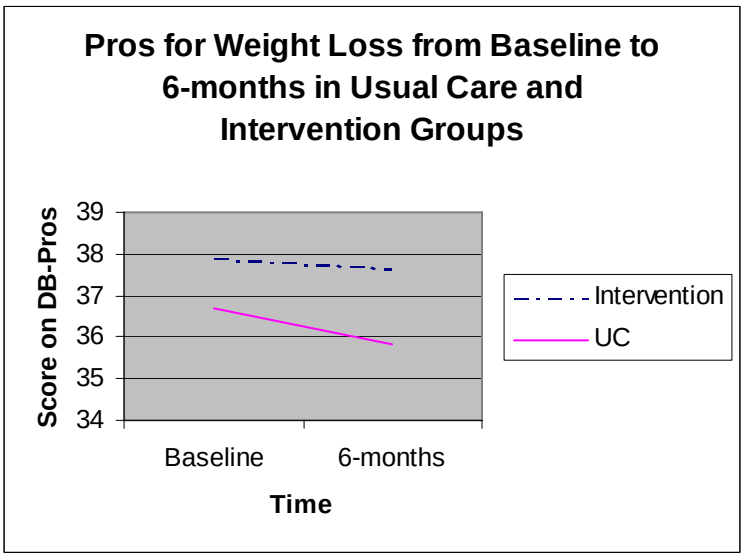

Figure 5. Pros for Weight Loss from Baseline to 6 months in Usual Care and Intervention Groups

Question #8. Will cons for weight loss be related to weight loss SOC at baseline in both the intervention and usual care groups?

In order to test research questions six through eight, a Multivariate Analysis of Variance (MANOVA) was performed. See Table 7 for means and standard deviations of outcome

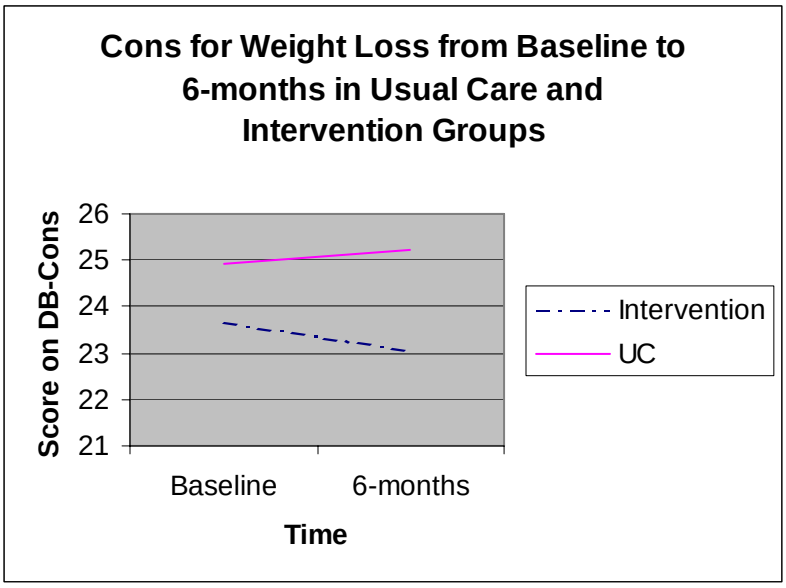

Figure 6. Cons for Weight Loss from Baseline to 6-months in Usual Care and Intervention Groups

variables at different SOC for weight loss. For the analysis, the independent variable was SOC for weight loss which had 4 levels (precontemplation, contemplation, action or maintenance) and the dependent variables were the WEL as well as the DBQ with scores provided for both pros for weight loss and cons for weight loss. The MANOVA was significant for a main effect of SOC, F (12, 429) = 2.36, p= .006. Follow-up one-way analysis of variance (ANOVA) revealed a significant main effect for the WEL, F (3, 212) = 3.14, p= .02; and DBQ- pros for weight loss, F (3, 3392) = 3.03, p = .03. LSD post-hoc analyses were used to assess mean differences between the groups for WEL and pros of weight loss (See Figures 7 and 8). On the WEL, there were significant differences between action (M= 146.7) and all other stages, including precontemplation (M= 102), contemplation (M=118.19), and maintenance (M= 117.5). The other three stages did not differ from each other. These results suggest that self-efficacy was highest in the action stage and that this stage differed significantly from all of the other stages (precontemplation, contemplation, and maintenance). Individuals in the action stage endorsed

being the most confident in their ability to lose weight. For DBQ-pros of weight loss, differences between action (*M*= 34.73) and maintenance (*M*= 38.27) approached significance (*p*= .06). Even though not significantly different, individuals in the maintenance stage endorsed more pros for losing weight than did individuals in the action stage. See Figure 9 for mean differences of DBQ-cons at weight loss SOC.

Table 7.

Means and Standard Deviations of Decisional Balance Pros and Cons and Weight Loss Self-Efficacy at Stages of Change for Weight Loss at Baseline (N=158)

	DBQ-Pros	DBQ-Cons	WEL
Precontemplation (N=3)	32.33 (11.85)	18.67 (4.72)	102.00 (29.55)
Contemplation (N=26)	36.15 (8.54)	26.58 (8.31)	118.19 (28.83)
Action (N=23)	34.73 (8.44)	24.04 (8.78)	146.70 (21.47)
Maintenance (N=106)	38.27 (8.04)	23.98 (8.01)	117.51 (35.50)

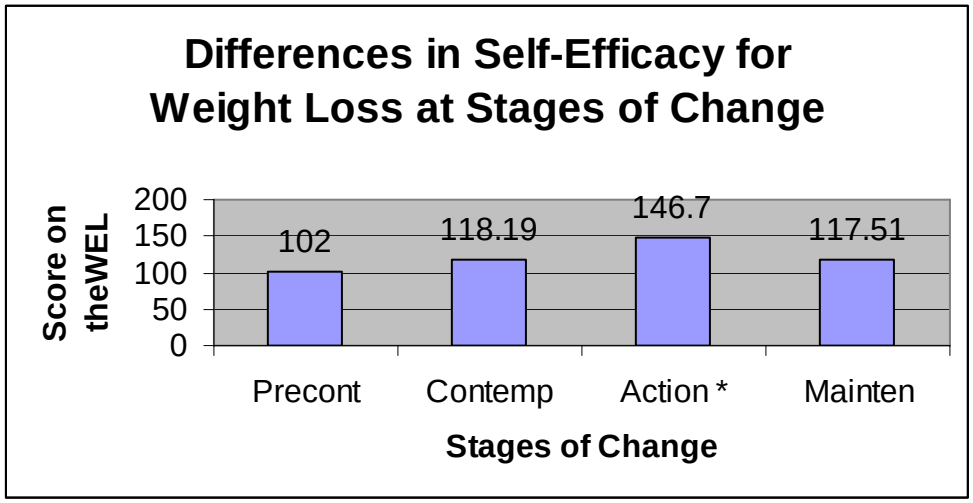

Figure 7. Weight Loss Self-Efficacy at different Stages of Change at Baseline for all Participants
* significant at $p<.05$

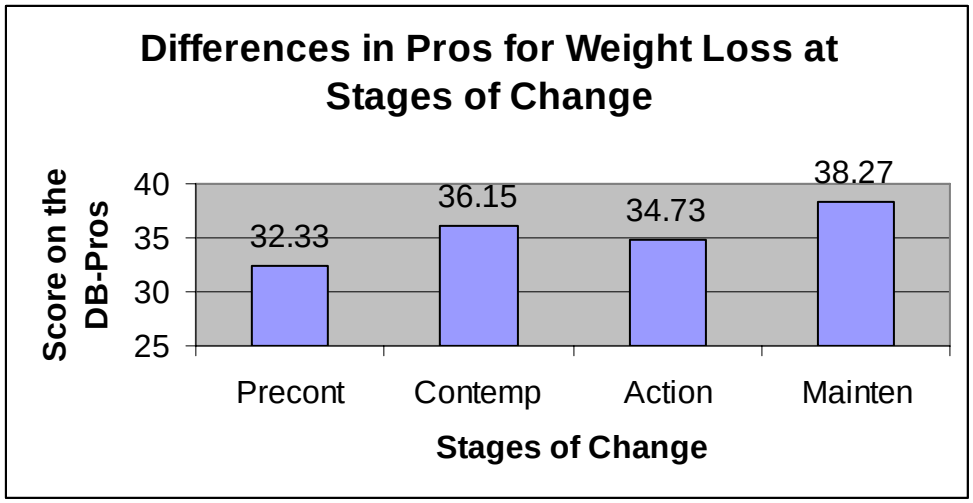

Figure 8. Pros for Weight Loss at different Stages of Change at Baseline for all Participants

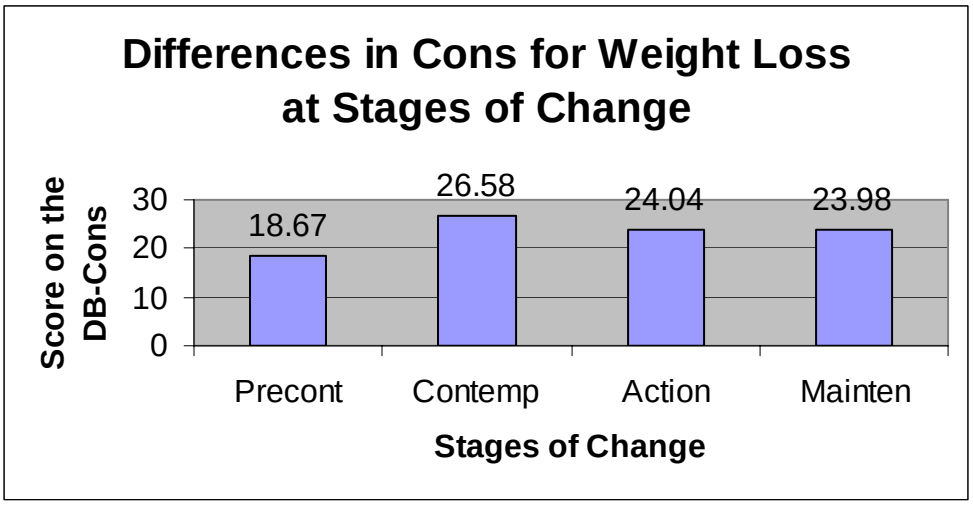

Figure 9. Cons for Weight Loss at different Stages of Change at Baseline for all Participants

DISCUSSION

The current study examined the theoretical underpinnings of an effective weight loss intervention based on the Transtheoretical Model. Specifically, it studied the effects of a stage-matched weight loss intervention on participant responses to SOC questionnaires assessing motivation for weight loss, weight loss self-efficacy, and decisional balance (pros and cons for weight loss). It also attempted to determine if responses to items assessing self-efficacy and decisional balance would differ at different SOC as proposed by the Transtheoretical Model. Overall, little support was found for the Transtheoretical model.

It was hypothesized that individuals in the intervention group would demonstrate a significant progression in SOC from baseline to the end of active treatment. In addition, it was proposed that the intervention and UC groups would significantly differ on SOC at post-treatment. There were no significant differences found overtime for SOC in the intervention group despite participants achieving clinically significant weight loss. There were also no significant differences found at 6 months between groups (intervention and UC) for SOC.

The study also assessed how a stage-matched intervention affected theoretically linked variables, decisional balance and self-efficacy, over time (baseline to 6-months) and between the groups (intervention and UC). The results did not support the hypotheses that the stage-matched intervention would lead to increased pros for weight loss, decreased cons for weight loss, and higher levels of self-efficacy from baseline to post-treatment (6-months) between groups. There was a significant effect for self-efficacy but no interaction effect for group and time was found. Given the lack of statistical significance for the interaction, the results do not support the initial hypothesis that the intervention would lead to increases in self-efficacy from baseline to post-treatment.

Lastly, we examined whether there would be differences in pros for weight loss, cons for weight loss, and self-efficacy at different SOC for all participants at baseline (before receiving the intervention). There were significant differences for self-efficacy at different SOC. Specifically, we found that self-efficacy for weight loss was highest in the action stage and that it differed significantly from all of the other SOC. These results suggest that individuals in the action stage feel most confident in their ability to lose weight when compared to individuals in the other SOC. The results were approaching statistical significance for pros of weight loss differing at SOC, with individuals in the maintenance stage endorsing more pros for weight loss than those in the action stage.

As part of the critical examination of these results, it is important to consider that despite the popularity of the TTM, the theoretical foundation of the TTM has been called into question by some investigators. Recently, researchers have voiced criticism of the Transtheoretical Model (Etter & Sutton, 2002; Littell & Girvin, 2002; Sutton, 2001;West, 2005). It is argued that the lines drawn between stages are arbitrary and there is little difference between individuals in different stages. For instance, let's consider a smoker who has had a past quit attempt in the last year, and has a plan to stop smoking in the next 30 days. The smoker would be classified as being in the preparation stage for smoking cessation. However, if this individual has a plan to quit in the next 31 days, he or she would then be classified in contemplation. The difference of one day, which seems trivial, makes the difference between categorizing someone in one of two very distinct SOC. Another criticism of the model is that the model assumes that the way an individual answers the SOC questionnaire is based on that individual's coherent and stable plans. The concept of intentions to perform these behaviors is less formulated. For instance, many individuals make behavior changes without any planning or preparation at all.

Further, the model does not examine the role of reward and punishment. The role of associative learning in developing these long standing habits such as sedentary behavior and unhealthy eating is not addressed in this model (West, 2005).

Completers versus Noncompleters

There were several participants who did not complete the study. Originally, 158 individuals were recruited to participate in the study and by 6-month follow-up, only 121 participants remained. That is, 37 individuals were not available for follow-up data at 6-months for various reasons including dropping out, missing the 6-month appointment, and being diagnosed with medical conditions after enrollment which violated inclusion criteria. The power of the analyses looking at effects of variables from baseline to post-treatment was reduced by the decrease in participants. The effects that the decreased power has on these analyses cannot be overlooked. However, given the large number of participants in the sample who endorsed being in an advanced SOC for weight loss, it is likely that the restricted range and not decrease in sample size contributed to most of the null findings.

There were few differences found between individuals who completed the study and those who did not. For instance, these groups were similar on demographic characteristics including education and marital status. In addition, these groups did not differ on study-related variables such as BMI, weight loss SOC, self-reported pros for weight loss, and confidence in their ability to lose weight. The comparison of the groups demonstrated that those who did not complete the study were younger and endorsed more cons for weight loss than completers.

Participants who were younger may have been more likely to not complete the study for many reasons. For instance, younger participants may have more obligations such as work and/or childcare, which may have been barriers for them to attend monthly visits. In addition,

they may not have viewed their weight as a major risk factor for health consequences and as a result not have been as motivated to participate in the study. Older individuals may have experienced either firsthand or secondhand through their friends/relatives, the effects that weight has on health, such as developing diabetes, heart disease, hypertension, high cholesterol, or certain types of cancer. Younger people may be less cognizant of their increased risk of developing these conditions if they are overweight or obese. Furthermore, younger patients may have a less established relationship with their physician. This may be the result of having less interaction with their physicians. Younger patients may have fewer health reasons to visit their physician than do patients who are older. Lastly, younger participants may have felt more confident in their ability to lose weight on their own as compared to older participants. It is likely that older participants have experienced more failed attempts at weight loss over their lifetime.

It makes sense intuitively that those individuals who endorsed more cons for losing weight would be less likely to complete the study. These individuals had been able to identify more reasons to not engage in weight loss behavior than those who completed the study. It is likely that these cons are related to the reasons why they did not continue in the study. For the noncompleters, it may be that the reasons to not engage in weight loss behavior outweighed and were more important then the pros endorsed for weight loss.

Effects of Intervention on Stage of Change

The intervention utilized in this study was based on the Transtheoretical Model, which posits that as an individual makes a behavior change they are likely to go through several distinct stages (Prochaska et al., 2002). The stages that are typically examined in research include: precontemplation, contemplation, preparation, action, and maintenance. Past research suggests

that an individual who has not begun to make even small changes will be in the precontemplation and contemplation stages (Prochaska et al., 1992).

Interestingly, even though the majority of the 158 study participants were obese or extremely obese, 81.7% of the sample endorsed being in either action or maintenance SOC for weight loss. To be classified in these two stages, the participants had to answer 'yes' to either or both questions: 1) in the past month, have you been actively trying to lose weight, or 2) in the past month, have you been actively trying to keep from gaining weight? To be classified in the maintenance stage, individuals also had to answer 'yes' to: have you maintained your desired weight for more than 6 months? These findings are consistent with past literature that has examined weight loss SOC in primary care patients. For instance, Wee and colleagues (2005) found that over 75% of overweight and obese, predominantly Caucasian primary care patients were in advanced SOC for weight loss. In fact, almost half of these patients were at an advanced SOC for weight loss and improving diet and exercise concurrently. Another study conducted by Logue and colleagues found that 80% of obese primary care patients were at advanced SOC for weight loss (Logue, Sutton, Jarjoura, & Smucker, 2000). The current study adds to this literature by generalizing the findings that the majority of overweight and obese primary care patients are at more advanced weight-loss SOC, to a predominantly low-income African American sample.

Although the current findings are consistent with past research, they are contrary to what one would expect with a sample of mostly obese patients. There may be inconsistencies between self-report and actual weight loss behaviors. For instance, the primary care clinic is a medical setting where weight is an issue that physicians often discuss with patients (Martin, Rhode, Howe, & Brantley, 2003). Patients may feel compelled to report being actively involved in strategies to lose or maintain weight as suggestions to lose weight may have been made during

past visits with their physician. It is likely that patients want to be seen in a favorable light by their physicians and, as a result, may endorse being at more advanced SOC for weight loss. Future research may want to assess the reliability of SOC for weight loss in patients across settings (primary care versus home).

These findings may also be attributed to patients' lack of knowledge on what strategies are effective in losing weight. Patients may have misconceptions about the processes necessary to lose weight. Indeed research on the population of patients from which the current sample was recruited has demonstrated poor knowledge scores on questionnaires measuring knowledge of diet and weight loss (Brantley et al., 1999). It may be that participants erroneously believe the behaviors they were engaging in were helpful in losing weight. It may be important to examine knowledge of different health behaviors such as diet and exercise and examine correlations between this knowledge and specific SOC for making dietary changes and increasing exercise.

In the current study, individuals in the intervention group did not demonstrate a significant advance in their SOC from baseline to post-treatment. These results again were not surprising given that the majority of individuals were already endorsing being in either action or maintenance. Each participant received materials that were tailored to their specific SOC for weight loss. For instance, if an individual endorsed being in the action stage for weight loss they received materials that were focused on the processes of change that occur at that stage (such as stimulus control, reinforcement management, social support) in order to aid in progressing them to a more advanced SOC. However, since the sample endorsed being at more advanced SOC at baseline, there was a restricted range of movement they could make. Therefore, it is likely that the SOC measure would not be sensitive enough to pick up on smaller changes made by these participants. Despite not finding a significant change in SOC, the intervention group did

demonstrate significant weight loss. It appears that some aspect of the intervention was successful in aiding weight loss, unfortunately it is not clear if the stage-matched aspect of the intervention was the key component.

The results were not significant for participants in the intervention group being at a more advanced SOC at post-treatment than those in the UC. It was hypothesized that those in the intervention group would be at a later SOC than those in the UC group because they received an intervention aimed at SOC progression. No significant differences were found between the groups at post-treatment. Therefore, we cannot conclude that the stage-matched intervention had the desired effect on SOC, which was the aim. Again, it is likely that the high numbers of individuals in the more advanced SOC at baseline in both of the groups (UC and intervention) made the progression more limited than if the sample was more evenly distributed for SOC. The study's limited power and the SOC measure's limited sensitivity may have restricted the ability to detect subtle changes.

Effects of Intervention on Decisional Balance and Self-Efficacy

The literature suggests a relationship between SOC and decisional balance and self-efficacy (Boudreaux et al., 1998; Carmack- Taylor et al., 2003; Horacek et al., 2002; Marshall & Biddle, 2001; Prochaska et al., 1991; Prochaska et al., 1994). However, little is known about the effect of a stage-matched weight loss intervention on self-efficacy or decisional balance over time, in a sample of predominantly African American primary care patients. The current study sought to examine self-efficacy and decisional balance over time (from baseline to post-treatment) and between groups (intervention versus UC).

The results of the study suggest that the stage-matched weight loss intervention that was effective for weight-loss had little effect on theoretically-linked variables such as self-efficacy

and decisional balance for weight loss. That is, even after receiving a stage-matched weight loss intervention and being successful at weight loss, these participants did not experience increased confidence in their ability to lose weight nor were they able to identify more reasons to lose weight. The intervention did not have the hypothesized effect of decreasing their reasons not to lose weight.

These results are consistent with past physical activity research (Pinto, Lynn, Marcus, DePue, & Goldstein, 2001). Pinto and colleagues found little support for their hypothesis that a stage-matched physical activity intervention delivered by a primary care physician would produce significant changes in theoretically linked constructs such as self-efficacy and decisional balance. In Pinto's study, the sample was predominantly Caucasian (97%) and older with the average age of participants being 65. The intervention involved two face-to-face meetings with the primary care physician as well as materials mailed to participants on 5 occasions, all aimed at increasing physical activity. The frequency of contact for the intervention group was similar to the current study. Pinto and colleagues found that in the short-term (6-weeks) the intervention did have an effect on increasing both self-efficacy and pros for weight loss however these effects were no longer present at 8-months. It is important to note, that similar to the current study, this intervention was successful in obtaining changes in the targeted behavior, in this case increasing physical activity (Pinto et al., 2001). The current research provides additional evidence that there is a weak relationship between stage-matched interventions delivered in primary care settings and concepts that are theoretically linked to the TTM such as self-efficacy and decisional balance. The current data add to the literature by examining this relationship with weight-loss constructs and utilizing a sample of low-income predominantly African American sample.

Research has consistently demonstrated a relationship between SOC and decisional balance and self-efficacy (DiClemente, 1986; DiClemente et al., 1985; Prochaska et al., 1991, Prochaska et al., 1994). In addition, several obesity studies have found that self-efficacy for weight loss (Clark et al., 1991) and exercise (Pinto, Clark, Cruess, Szymanski, & Pera, 1999) increase over the course of obesity treatment. It is important to examine the reasons why the stage-matched weight-loss intervention would have an effect on weight loss but not these theoretically linked variables. One explanation is that the majority of participants in the sample already endorsed being in more advanced SOC, therefore they may already be aware of the benefits and costs of weight loss. In addition, they may already have higher levels of confidence in their ability to lose weight. The weight loss intervention may have provided these patients with the tools that were necessary to obtain weight loss but not affecting their decisional balance or self-efficacy. It is likely that different mechanisms such as education on diet and exercise, reinforcement strategies, goal setting, or self-monitoring were the salient factors that aided in weight loss. These null findings may also be the result of the small sample size and decreased power of the study.

Examination of Self-Efficacy at Baseline for Different SOC

The results of the current study are not consistent with the past literature examining the behavioral and cognitive characteristics of individuals at various SOC for different health behaviors. For instance, research consistently demonstrates a relationship between more advanced SOC and higher levels of self-efficacy (DiClemente, 1986; DiClemente et al., 1985; Prochaska et al., 1991). The data from the current study suggest that an individual's confidence in their ability to lose weight was highest in the action stage. Self-efficacy in the action stage was significantly different from all other stages including a more advanced SOC, maintenance. Even

though individuals in the maintenance stage have been successful at maintaining their weight loss for at least 6 months, they are less confident in these abilities then individuals who have been actively engaging in weight loss for less time. These results are surprising as research with exercise self-efficacy in low-income African Americans is consistent with the extant literature suggesting that the highest levels of self-efficacy are observed in the maintenance SOC and that this group differs significantly from all other SOC including action (Carmack-Taylor et al., 2003).

There is no research, to the author's knowledge, that has demonstrated significantly higher levels of self-efficacy in the action stage when compared to the maintenance stage for weight loss. It is likely that actively engaging in weight loss behavior in the short-term, leads to increased confidence in one's ability to lose weight. As weight loss is typically easier at first and there are high rates of relapse over time (weight gain), the maintenance stage may be associated with decreased feelings of confidence. As weight loss SOC was measured generally and SOC was not assessed for specific health behaviors related to weight loss (such as exercise or calorie restriction), it is difficult to ascertain if self-efficacy for certain behaviors and not others decrease over time. More specific information on weight loss behaviors such as exercise and dietary SOC may help delineate if certain behaviors are more susceptible to decreases in self-efficacy. The results suggest that the relationship between self-efficacy and SOC for weight loss is different in low-income predominantly African American patients. Although the sample obtained significant weight loss, tailoring interventions to aid in increasing or maintaining self-efficacy throughout the maintenance SOC may have an effect on the amount of weight lost and prevention of weight regain in these samples.

Examination of Decisional Balance at Baseline for Different SOC

Past studies have shown that in earlier SOC, cons for a behavior tend to outweigh the pros. As SOC progresses a crossover occurs (typically in preparation SOC), with pros outweighing the cons for the behavior in later SOC (O'Connell & Velicer, 1988; Prochaska et al., 1994). Studies have established this relationship with various health behaviors in samples of low-income African American primary care patients (Boudreaux et al., 1998; Carmack-Taylor et al., 2003; O'Hea et al., 2004). In fact, Carmack and colleagues found that the crossover for pros and cons occurred in the contemplations stage whereas past research consistently demonstrates that it occurs in the preparation stage. This study demonstrated the need to validate this behavior change model for different health behaviors, including weight loss, in underserved populations (Carmack-Taylor et al., 2003).

In the examination of the relationship between weight loss SOC and pros and cons for weight loss, significant differences in these variables at different SOC was not found. The pros for weight loss were greater than the cons at all levels of change for weight loss and no crossover between these two variables at any SOC was observed. This suggests that this sample of primary care patients were able to identify more reasons to lose weight than reasons not, and this pattern was consistent through all levels of motivation for weight loss.

Although not statistically significant, it is important to note that there were higher levels of pros endorsed in the maintenance stage versus the action stage. This may demonstrate that in the maintenance stage the benefits of weight loss are more salient than in the earlier stages. For instance, individuals in this SOC have likely experienced (relatively recently) the effects that weight loss has on a variety of things such as their appearance, health, energy level, and sleep and may be more attuned to these as compared to those early in the action stages. However,

given the lack of variability in the data, the null results maybe the function of the majority of the sample being in the action or maintenance SOC for weight loss. It may also be the result of the limited sample size of 158 participants as both Boudreaux et al. (1998) and Carmack-Taylor et al. (2003) utilized samples with over 500 patients.

Effects of the Stage-Matched Intervention on Weight Loss

Individuals received a stage-matched intervention in the primary care setting that was aimed at reducing weight. The primary care setting offers the unique opportunity of targeting individuals who may not be actively seeking out help with health behavior change. As many individuals come into primary care settings with health issues on their minds, this setting also presents an opportunity to educate patients on how obesity is related to many chronic medical conditions (Field et al., 2002). Despite the many benefits of addressing obesity in this setting, physicians endorse several barriers to addressing weight loss methods with patients including lack of time, lack of training on weight loss methods, and not feeling that their patients are interested (Frank, 1998; Rippe, Crossley, & Ringer, 1998; Thomas, 1995). For the current study, we were able to address some of these barriers. For instance, we were able to provide physicians with training on weight loss methods and how to aid individuals in making small behavior changes. In addition, the intervention was structured to be brief (15 minutes) so that physicians would not have to spend excessive time with each patient. Lastly, patient's motivation to lose weight was assessed at the visits.

Research demonstrates that primary care settings that serve predominantly low-income African Americans have higher rates of obesity than national samples (Bodenlos, Bellanger, & Jones, 2005; Huang et al., 2003). For instance, Bodenlos and colleagues suggest that patients in the public hospital system in Louisiana are two times more likely to be overweight or obese

when compared to the national sample. Similar to research with a national sample this study found that African American females had the highest rates of obesity, which demonstrates the importance of developing effective weight loss interventions for this group (Bodenlos et al., 2005; Hedley et al., 2004). The African American female primary care sample that was utilized in the current study had similarly high rates of obesity with 87.9% of patients being obese or extremely obese (mean BMI of 38.72).

The brief stage-matched intervention used in this study with a primary care sample of African American females was successful for weight loss (Martin et al., in press). In fact, Martin and colleagues found that even when the baseline data for the individuals who dropped out were carried forward in the data analyses these significant differences were still found. The intervention was effective in producing modest weight loss (mean loss of 2.0 kilograms, approximately 4.4 pounds) that is comparable to more intensive group weight loss studies with African American women (Kumanyika & Charleston, 1992), Research has demonstrated positive health benefits (e.g., improved insulin sensitivity and reduced blood pressure) of even modest weight loss especially if the weight loss is maintained (Goldstein, 1992; Mertens & Van Gaal, 2002). The UC group demonstrated a .20-kilogram (.44 pounds) gain over the same period that the intervention was administered. Therefore, the intervention was effective in producing a small weight loss and prevention of weight gain. It is also important to consider that the intervention was brief (15 minutes once a month), and administered by a physician in a primary care setting, and these individuals were not necessarily seeking out a weight loss program. The weight loss achieved, given the brevity of the intervention, demonstrates how influential the interventions delivered in this setting can be, especially with African American females who consistently demonstrate the highest rates of obesity (Bodenlos et al., 2005; Hedley et al., 2004).

Limitations

There are limitations to the current study that should be noted. First, individuals who were recruited for the current study had to attend the appointments. Therefore, the sample was limited to those who make and attend appointments at primary care clinics in the public hospital setting. National data suggests that 12 million appointments in the primary care setting are not attended each year, approximately 6.5% of the appointments made (Martin, Perfect, & Mantle, 2005). This "no show" rate is likely to be higher in a primary care setting serving predominantly indigent patients who have more barriers to attending appointments (i.e., transportation). In addition, the study used 8 primary care physicians who were randomly assigned to either the UC or intervention groups. By randomizing the physicians and not the patients, there was more control over potential carry-over effects of a physician who is responsible for delivering both the intervention and usual obesity care to patients. However, because the patients were not randomized, we cannot say that the groups were not inherently different. For instance, the patients may have sought out their current physician because of reasons that may affect the outcome of the study. Rapport may be better between certain patients and physicians than other pairs and therefore make change more likely for those individuals. Better relationships between physicians and patients may have also influenced how individuals rated their current SOC for weight loss, as demand characteristics may have played a role. A measure of social desirability could have been used to further assess the role that demand characteristics may have had in the study. Second, there were 121 participants that remained in the study at 6 months. Although the only differences between those who remained in the study and those that dropped out were age and cons for weight loss, this still limits the power of the analyses performed. The original power analysis was based on 158 participants, so as a result of the drop out rate, the power of the

analyses has decreased. It was hypothesized that with 158 participants, there is approximately an 80% chance of detecting an effect for change in SOC with alpha set at .05. With 121 participants, the power decreased and we had a 65.6% chance of detecting an effect with an alpha set at .05. It may be that the high attrition rate and subsequent decrease in power are the reasons we did not obtain significant results. Lastly, the measure used to assess SOC was a limitation. It was a brief, four-item self-report measure of weight loss SOC that did not assess preparation. Further research is necessary to compare the use of other measures of SOC for weight loss.

Future research can build on the criticisms of the model and the results of the current study. For instance, given the recent condemnation of the model (Etter & Sutton, 2002; Little & Girvin, 2002; Sutton, 2001; West, 2005), it is necessary to assess whether the information provided about weight loss in the intervention was sufficient alone in decreasing body weight or if it was the addition of the SOC component. A recent study found that just increasing low-income female patients' knowledge of nutrition is beneficial in increasing weight loss (Klohe-Lehman et al., 2006). In fact, Klohe-Lehman and colleagues suggest that larger increases in knowledge are related to larger decreases in body weight. Another recent study, a randomized control trial conducted with obese men and women from primary care sites, did not find differences in weight loss between two groups; one receiving an augmented UC which included information about diet and exercise and a group that received an intervention that was tailored to SOC (Logue, Sutton, Jarjoura, Smucker, Baughman, & Capers, 2005). These results suggest that just providing information to primary care patients on how to lose weight is just as effective as a stage-matched model. More research is necessary to delineate the components that are most effective for weight loss especially in the primary care setting. Specifically, studies are needed

with low-income African American patients, comparing stage-matched and more general dietary/exercise interventions to usual obesity care in primary care settings.

Summary and Conclusions

There is much valuable information that can be obtained from this study. This was the first study to assess the effects that a stage-matched weight loss intervention had on SOC, self-efficacy and decisional balance in a low-income predominantly African American primary care sample. It is important when conducting research utilizing a theoretical model, to assess the effects that the model has on the theoretically linked variables. In the current study, we were assessing how the intervention affected SOC and variables that have been found to be related to SOC in research, i.e., self-efficacy and decisional balance. According to the results, the majority of the low-income, African American female primary care population endorsed being in advanced SOC for weight loss, despite the majority of these participants being obese or extremely obese. The current data lend support to the research suggesting that large numbers of overweight and obese primary care patients are in advanced SOC for weight loss (Logue et al., 2000; Wee et al., 2005). It remains unclear if this is a function of demand characteristics or poor knowledge on the part of patients on effective weight-loss strategies. More research is necessary to examine the stability of weight loss SOC for patients across settings to determine if it is a function of the setting or a stable construct.

As SOC and related variables did not demonstrate significant change over time, it is necessary to further examine whether the Transtheoretical model is the component of the intervention that aided in weight loss success or whether it was the general information/attention provided. This is especially important as the TTM is receiving increased criticism (Etter & Sutton, 2002; Little & Girvin, 2002; Sutton, 2001; West, 2005). The current study did find self-

efficacy to be highest in the action stage, which suggests that getting people engaged in weight loss behavior will increase their confidence in their ability to lose weight. However, this level of confidence decreased by the maintenance stage. This was inconsistent with the past literature that suggested self-efficacy for health behaviors is significantly higher in both action and maintenance SOC (Carmack-Taylor et al., 2003; DiClemente, 1986; DiClimente et al., 1985; Horacke et al., 2002; Marshall & Biddle, 2001; Prochaska et al., 1991). The change in self-efficacy for weight loss may be different throughout the SOC for weight loss in this population of low-income African American primary care patients. Therefore, the use of weight loss methods aimed at maintaining higher levels of self-efficacy through the maintenance SOC may be key in increasing the amount of weight lost and prevention of weight regain in this population.

Overall, this study presents a first attempt at understanding the theoretically underpinnings of a stage-matched weight loss intervention in an African American primary care sample. The results of this study support the need for further evaluation of the use of the TTM in developing weight loss interventions, as theoretically linked components did not demonstrate the predicted changes in our sample. There were some limitations of the study including a small sample size and restricted range in weight loss SOC. However, the results do suggest that stage-matched weight loss interventions work differently in samples of low-income African American primary care patients. As recent data suggest that there is no added benefit of a stage-matched intervention to weight loss (Logue et al., 2005), more research comparing stage-matched to more general weight loss interventions in samples of low-income African American primary care patients is necessary.

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VITA

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